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Railway Age

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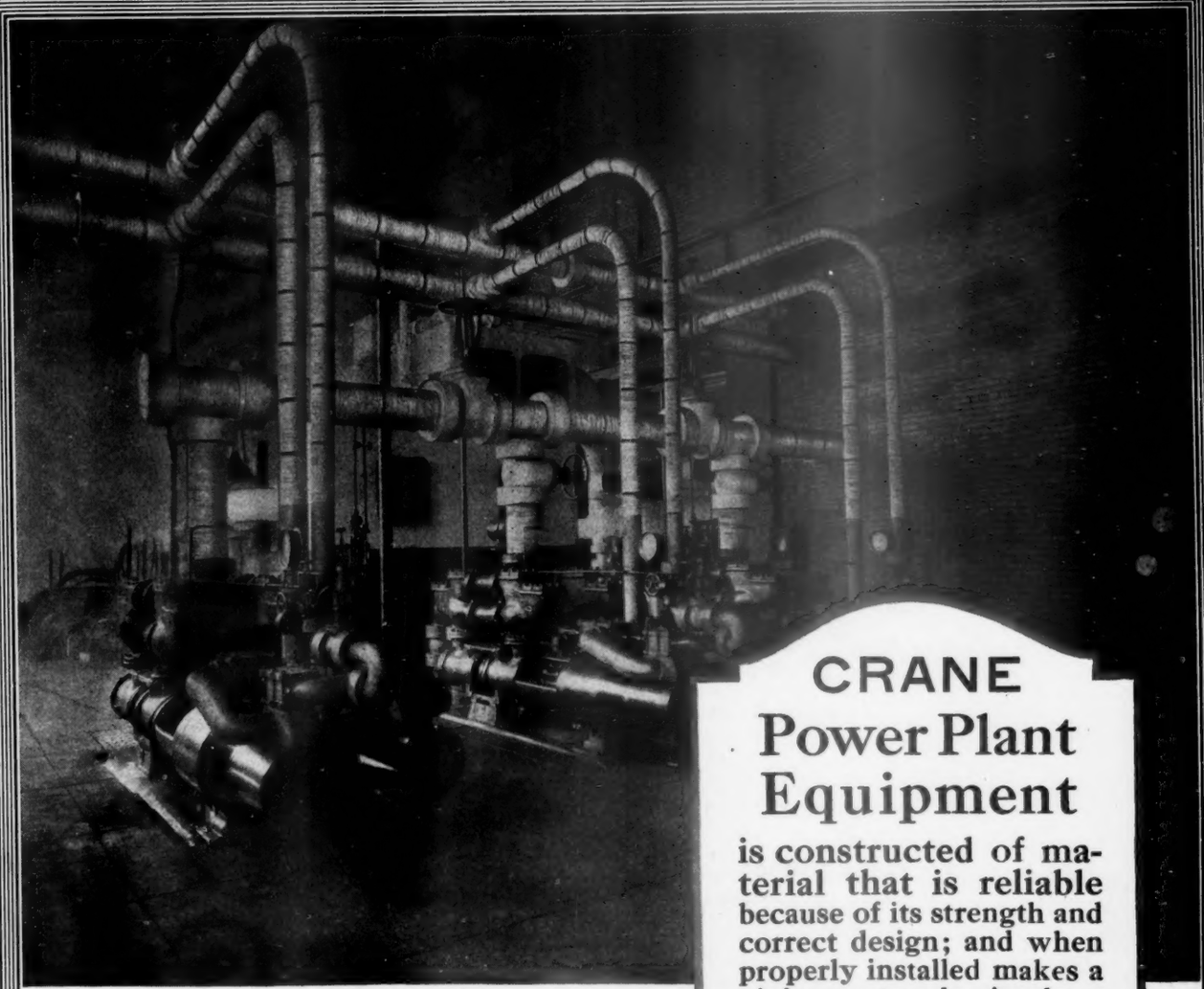

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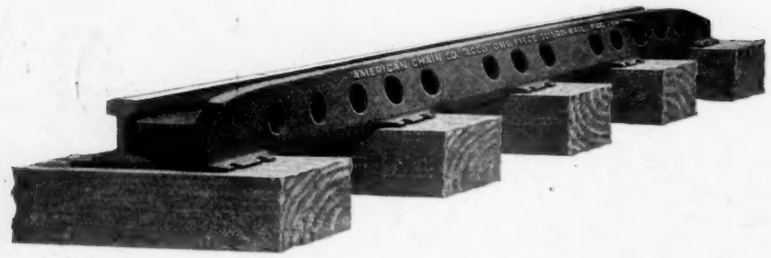

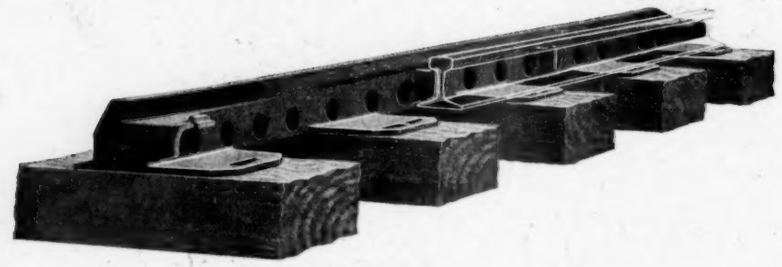

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EDITORIAL

Railway Age

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Activities of the T. & T. Section

A perusal of the reports of the Telegraph and Telephone Section, A. R. A., presented at the March stated meeting held in Richmond, Va., this week gives evidence that this association is doing a great deal to increase the efficiency of the railroad communication systems. One report of 92 pages, describing in detail various telegraph and telephone circuits, could well serve as a text book for any one desiring a general knowledge of railroad communication circuits. Standard minimum clearances between wires of crossarms and the running rail have been established by the association, and the committee on wire crossings has fixed the minimum clearance between power wires and communication circuits. Of special interest to operating officers is the finding of this association that the interchange of traingrams between railroads as an overnight feature would not meet the requirements for such communications, and that because of the postal laws and the added expense of extra messengers at transfer points the introduction of such a practice is considered to be impracticable. In another report the association offers suggestions to the users of telephones that will materially increase the efficiency of transmission. By rendering such practical service the Telegraph and Telephone Section is serving the railroads in a commendable way and should receive the co-operation of the other units of the A. R. A. in order that the efficiency of railroad communication may be increased to meet the growing demand for this important service.

An Organization for Water Service

To what extent are the railroads aware of the advantages to be derived from a definite organization for water supply service? How many roads have established and now maintain such organizations? These are questions which arose prominently upon the reading of certain communications presented by the Committee on Water Service during the convention of the American Railway Engineering Association on March 16. Following an introductory statement to the effect that a water supply of ample quantity and of satisfactory quality is one of the essential requirements for the successful operation of a steam railroad (a truth which in itself does not always appear to receive the general recognition it deserves), this communication brought to light certain significant facts concerning this phase of railway operation. The annual water consumption on American railways, the communication showed, is approximately 900,000,000,000 gal., with nearly $40,000,000 expended annually in merely operating and maintaining the 14,000 stations which supply this water. This expenditure assumes special significance when one considers the using as well as the obtaining of much of this water. It is not surprising that students of this subject should advance the plea made by the Water Service Committee for a definite water supply organization on each road. Those departments of water service which hold out the greatest promise for economies and improved service deal with phases of work which demand special study and close application as distinguished from the superficial attention of those who are either not especially trained or by reason of their other responsibilities are unable to give the subject the thought it requires. No better proof of this is to be found than the fact that those roads which maintain special organizations have secured the most satisfactory results. A specialized organization thus not only appears to be desirable in water service as in other departments of railway work, but has definitely proved itself so and those roads that do not maintain such organizations now might well direct close attention to this phase of the railway problem.

New England Divisions

The matter of New England divisions has been carried into the courts. A considerable list of trunk line and C. F. A. carriers have filed in the federal court at New York a bill in equity asking for an injunction to restrain the enforcement of the Interstate Commerce Commission's order for increased divisions of the through rates. The New York Central is not included in the list of carriers mentioned because, it is understood, that carrier will carry on an independent action related more particularly to the Boston & Albany, leased by the New York Central which, although almost entirely in New England, was not a party with the New England carriers. The Pennsylvania and Baltimore & Ohio also are not parties. This New England division's affair has become one of the most complicated matters of its kind which has been offered for solution in a long time. The present divisions in themselves are complicated. The scope of the authority of the Interstate Commerce Commission, insofar as concerned its power to order a general blanket increase in divisions, was in question as is shown by the fact that the increase which has been ordered and which is now still in question was made only after a rehearing and supplementary decision. The question has also arisen as to whether other carriers may not also be entitled to treatment similar to that given the New England lines. Insofar as concerns the New England carriers it must be admitted that they are meeting almost unsurmountable difficulties in overcoming the handicaps which confront them as a result of federal control. The *Railway Age* believes it unfortunate, however, that the two sides are so far from agreement that the matter must be taken into the courts.

The Air Brake and Train Operation

There is an impression which prevails among many railroad officers that the Air Brake Association is composed of a body of inspectors whose efforts are largely devoted to matters relating to the maintenance of the various air brake devices and that consequently they belong solely to the mechanical department. While it is true that maintenance matters do demand a large amount of attention from the men who make up this association, the fact that much of their work is vitally connected with matters that concern train operation should not be overlooked. The air brake has become such a common thing that one is apt to overlook the fact that its development has made possible the handling of long, heavy

freight trains and has brought about the modern freight locomotive of high tractive effort. Moreover, if it were not for reliance upon the air brake, it would be impossible to handle passenger traffic with reasonable safety even at greatly reduced speeds. It is not too much to say that our present practices in train operation have largely been built up on the foundation of the air brake. The men composing the Air Brake Association have assisted materially in bringing the brake to its present high state of development and with proper support undoubtedly will assist in meeting the needs of future requirements. This is possible because the men are in the field so much of the time riding locomotives and helping enginemen and trainmen obtain the best results from the brake. Even maintenance and yard inspection work has to do so directly with train movements that the work of the association should interest transportation officers even more than it does those in the mechanical department. A broader appreciation of the valuable work of the association on the part of higher railroad officers and their support in making the annual meetings a success would make the association of increasing usefulness.

American Aid for Foreign Railways

The railway problem, aside from its financial aspects, of India, South America, Australia, China, Africa or, in fact, almost every part of the world except Western Europe, is essentially the same as that of the United States. In other words, most countries need railways so constructed and equipped that they can operate profitably and efficiently with rather light traffic, made up in large proportion of low grade commodities. Under such conditions heavy train loading—which entails heavier cars, heavier power, stronger draw gear and air brakes—is necessary for efficiency. Also, under such conditions, it will be found that double track cannot, generally speaking, be profitably utilized and that a single track only can be provided. Railway development to meet such conditions as these has unquestionably advanced further in this country than anywhere else in the world. Why is it, then, that in most of the countries we have named we find the railways built and equipped upon lines suggested by the practice of Western Europe, where intense traffic is the rule? The answer is that capital from Western Europe built these railways and naturally patterned them after their own carriers. Until recent years this country was in no position to build foreign railways but lately we have advanced millions of dollars for railway development abroad and the field for profitable investment in this direction is practically unlimited. The mere sending of dollars, however, is not enough. With money for development should go American equipment and American railway men. Otherwise the countries where extensive railway development is contemplated will be unable to secure the full advantage which our experience with problems, identical with theirs, can give them.

The Great Northern Dividend

The Great Northern directors, at their meeting in New York on March 15, deferred action on the usual quarterly dividend on the seven per cent preferred stock. The hope was expressed that it would be possible to maintain the present seven per cent rate, but that the procedure in the future would be to put the dividends on a semi-annual instead of on a quarterly basis. This announcement, which is given in greater detail in the financial columns of this issue, was received with mixed emotion in Wall Street. The Street showed itself skeptical, in particular, as to whether the hope of the semi-annual dividend would be realized. Great Northern stock which had been quoted between a high of 80⅜ and a low of 70¼ in the first two and one-half months of 1922 and which on March 14 closed at 80⅜, broke sharply on March 15 (the day of the directors' meeting) and closed at 77⅜. On Thursday it closed at 76; on Monday of the present week it closed at 75. The Great Northern has only one issue of stock, the preferred. This stock has paid dividends regularly for an indefinite period. The seven per cent rate was established in 1900 and has been maintained since that time. The railroad man as a rule is not inclined to agree in many cases with Wall Street's opinion of railroad operations. In the case of the Great Northern, the railroad man will have to admit, however, that Wall Street was correct. Wall Street has been dealing in Great Northern stock at about 75. This is a low price for a seven per cent stock. It evidences that Wall Street has known that Great Northern has been confronted with many difficulties and that the Street has, on the whole, diagnosed the situation correctly. The Great Northern is at present showing signs of improvement, but because of the manner in which the larger part of the road's traffic moves in the latter part of the year, not much value can be placed on the January and February returns. It will be interesting, therefore, to watch the course of quotations on Great Northern stock during the coming months.

The Neglected Engine Lathe

It is human nature to be fascinated by the spectacular, deeply interested in the unusual, but often neglectful of common things of much greater aggregate importance. In the railroad mechanical world attention is focused on large shops and terminals, which as a rule benefit by new machinery and equipment purchased. This occurs in spite of the fact that three-quarters of the locomotive shops in the country are relatively small, having an output of 10 heavy classified repairs per month or less. Two-thirds of the enginehouses also are small with not more than 10 stalls per house. It is obvious that the use of large capacity, highly specialized machines would not be justified in these small shops and enginehouses which sorely need an adequate amount of the more commonly used machinery, as efficient in operation and power consumption as possible. The importance of turret lathes, automatics and other production machines in the larger shops is rightly emphasized, but the more common engine lathe should not be forgotten. Aside from drills, the engine lathe is the only turning machine in many small shops, and even in large shops it outnumbers any other type of machine three to one. On the basis of the actual number of machine tools in operation in railroad shops and enginehouses the lathe is easily of first importance. It should not be forgotten in requisitions for new tools because much money can be saved or lost depending upon the condition of lathe equipment. The modern product, of which manufacturers are justly proud, combines adequate power with high production, accurate work and ease of control. These features, together with efficient tools and jigs for each particular job, greatly conserve the operator's time, increase output and decrease costs.

Protecting Records From Fire

The Chicago, Burlington & Quincy office building fire has been studied with great interest by structural engineers because it has served as a practical demonstration of the behavior of the modern protected steel frame building in the face of a great fire. Investigation indicates that the building is structurally intact and there is reason to believe that it served effectively as a barrier to the progress of a great fire which

otherwise might have wiped out a large part of the city of Chicago. Speculation along that line gives but scant consolation for the loss of valuable records suffered by the Burlington as the result of fire which came in through the windows and destroyed the combustible contents of seven floors of the office building except where locked in vaults. In the case of a great fire such as occurred in the highly combustible buildings in the block adjacent to the Burlington structure, the window is the vulnerable detail and it is doubtful if any form of window construction would have prevented the ignition of the woodwork inside of the Burlington offices. In the face of such a hazard, therefore, no scrap of paper is safe unless it is enclosed in a fireproof vault of approved construction, for in the Burlington building filing cases afforded no protection whatever for their contents. These facts having been presented, the reader must be left to apply his conclusions with respect to his own files for in no two cases will the hazard be exactly the same. In general, it may be said that a record is not safe unless it is stored in a fireproof vault and that it would be well to keep within the walls of the vault all papers not required for current work. Working files cannot be kept there at all times, nor is it practical to store them all in vaults over night, but a large part of the records and files can be so protected. In the interest of security, therefore, it is important to study the actual hazard to which they are imposed under normal working conditions.

The Automatic Train Control Hearing

THREE POINTS STAND out in the hearing before the Interstate Commerce Commission on its automatic train control order. These are: That in the proposed order the specifications have been so amended that a simple automatic stop device would appear to be ruled out; that additional data had been collected by the American Railway Association without the co-operation of the Bureau of Safety, and that it is the view of the carriers, after 15 or 20 years' investigation and test, that train control devices are still in the experimental stage.

Referring to the specifications in the proposed order: A year ago general requisites for automatic stops and automatic speed control were adopted by the A.R.A. Committee on Automatic Train Control and by the Bureau of Safety of the Interstate Commerce Commission. When the tentative order was issued by the Interstate Commerce Commission on January 10 last, paragraph b, under Automatic Stop, reading "under control of enginemen, who may, if alert, forestall an automatic brake application and proceed" had, for some reason, been eliminated. This apparently would tend to prevent the use of devices having that feature. At the same time, reference is made by the commission to the service records of the three roads having devices in use (C. & O.; C. & E. I.; C. R. I. & P.), which apparently do not qualify under the requisites. In this connection it was the feeling of the committee representing the railroads (the "Denney Committee") that this paragraph should be restored, for reasons well set forth by A. M. Burt.

Certain defects which might cause objectionable or dangerous failures of the three devices in service, collected during the last 15 months, were pointed out by the railroads' committee and were concurred in by representatives of the Bureau of Safety. At the hearing it developed that the Denney committee had recently placed sub-committees on the different roads, without the co-operation of the Bureau of Safety, in order to observe conditions during winter weather, as a result of which some additional data were presented at the hearing. In these later records the Bureau of Safety stated that it did not concur, and so wished to go on record, as none of its representatives were present. It was on the basis of defects found to exist on these three installations and the desire to try out other types, that the carriers made their plea to have the order withheld. However, it is well to point out that with the exception of some 12 additional defects found by the sub-committee, information on this subject was in possession of the commission some time before the tentative order was issued and it is to be presumed that this was considered carefully before it was drawn up.

Another argument advanced by the railroads why the order should not be entered was that because of the defects found in these inspections, and the fact that changes in design were being made and improvements added, the art was in the experimental stage. The fact that the feasibility of the inductive type of apparatus has not as yet been demonstrated and that it shows promise, was dwelt upon as an additional reason why the order should not now be issued. Several roads, in their separate pleas, pointed out the desirability of installing automatic block signals throughout their principal lines before being required to install train control.

It would appear that any order issued by the commission should be amended as regards the present requisites, in line with the request of the carriers. One railroad system ought not to be required to make double installations, as is required in two instances; and there is force in the contention that much more good may be accomplished if certain carriers are permitted to make installations of automatic block signals in many places where they are badly needed, before such an order is made applicable to them. The one constructive result of the hearing is the proposal embodied in paragraph 3 of Mr. Denney's memorandum, wherein the railroads promise, both jointly and individually, to continue all reasonable assistance in the work of development, as the commission may direct. The only result expected from this hearing was the establishment of a basis for modifying the commission's drastic proposal of January 10; and this paragraph 3 constitutes a definite step in that direction.

The Railway Wage Situation

THE TESTIMONY introduced by the witnesses for the railways in the wage hearings now going on before the Railroad Labor Board has proved at least three very important facts of great pertinency in relation to the question whether railway wages should be readjusted downward. These are:

First, that the present wages of most classes of railway employees are higher in proportion to the cost of living than when the Labor Board awarded a reduction last year, and much higher in proportion to the cost of living than at the beginning of the World War. This is not true, however, as to all classes of employees, especially certain classes in train service.

Second, that the wages paid in outside industries for labor doing similar kinds of work vary widely in different territories and even in different communities in the same territory.

Third, that in almost every part of the United States the railways are paying higher wages than outside industries to labor doing comparable work.

The two principal standards established by the Transportation Act for the measurement of the reasonableness of railway wages are the cost of living and wages paid in other industries. The reduction in the cost of living which has occurred within the last two years is under the law a valid argument for greater reductions in wages than have been made. Measured by the standard of wages paid in other industries, there is under the law justification not only for substantial reductions in the wages of many classes of railway employees, but for very extensive readjustments in them. If wages in the railroad industry are to be measured at all

by wages in other industries, there can be no defense for the Labor Board maintaining throughout the country wages, such as those for common labor, which are much higher than those paid for similar labor in any other industry. When railway wages are kept higher than those in other industries and railway rates are maintained to pay these higher wages, railway labor becomes a privileged class which is subsidized largely at the expense of the large majority of the population which has smaller incomes than railway labor has.

Two of the most significant features of the statistics concerning the wages being paid in other industries are, first, as already indicated, that wages in outside industries vary widely in different territories and communities; and secondly, that the differentials between the wages of skilled and unskilled labor are much greater in other industries than they are at present on the railroads. The former condemns the present system under which railway wages are standardized throughout the country. How, in strict accordance with the provisions of the Transportation Act, can the Labor Board require the railways to pay virtually the same amount for common labor in the southwest and in the northwest, when in other industries common labor is paid only 10 to 25 cents an hour in the southwest and from 31 to 45 cents in the northwest?

Perhaps, however, the most indefensible feature of the present railway wage scales is that they force the payment to unskilled labor of wages which are relatively much too high in comparison with those paid to skilled labor. This is contrary to every sound principle, whether the matter be regarded from the standpoint of labor, of the railways, or of the public. It destroys the incentive of the unskilled man to become skilled, and the incentive of the skilled man to maintain and try to increase his skill. They thus tend directly to reduce the efficiency of all classes of labor. The wage scales proposed by the railroads are sound in proposing to widen the differentials between the pay of the unskilled and the skilled.

The leaders of the shop crafts unions have intimated that they will not only resist reductions, but even seek increases in wages. As in previous hearings they will doubtless suggest that the railways pay excessive prices for coal, equipment and materials; that the concerns from which they buy these things are under the same financial control as the railroads and make large profits, and that if the railways would pay lower prices for the other things they buy they could pay higher wages to labor. In the first place, however, it is simply not true that these concerns are under the same financial control as the railways. In the second place, it can easily be shown that at the present time these concerns are not paying as high wages as the railways. Therefore it may occur to the representatives of the employees of the equipment companies and the steel and other material companies to suggest that if any of the alleged huge profits and surpluses of these companies are to be used to pay labor higher wages, these higher wages should be paid to the employees of these companies, and not to the employees of the railways.

It is a very ungrateful task to advocate reductions in the wages of any class of workingmen, but no industry can pay out for labor, coal, material and taxes more than it can earn. Furthermore, no industry can live, much less prosper, without earning a reasonable net return on the investment in it. The railways are confronted with a practically universal demand for reductions in rates. If substantial reductions in rates are to be made, they must be made either at the cost of some reduction in wages, or at the cost of the bankruptcy of the railroad industry.

There is only one way in which labor, as a class, can hope to secure a large and permanent increase in its real wages, and that is through a large increase of production. Unless railway employees, by more efficient work, will contribute their share toward this increase in production, they cannot get their share of the increase in real wages which it would make possible. Unfortunately, the very labor leaders who demand the highest wages for labor are the most active and effective in securing reduction of hours, and restrictive working conditions, which place the greatest obstacles in the way of securing the needed increases in production.

Well, Where Are We Now?

"WHEN THE MARINER has been tossed for many days on an unknown sea he naturally avails himself of the first pause in the storm, the earliest glance at the sun, to take his latitude and ascertain how far the elements have driven him from his true course." So much for the mariner. Back in November, 1921, there appeared in the columns of this paper an article entitled "The Interior Treatment of Boiler Waters," and in the same issue a brief editorial comment by way of ushering, as it were, the subject matter involved to the forum of thought, of consideration and discussion. That was four months ago.

Since then, what vicissitudes have not been the lot of this well-meaning article, even the editorial comment not escaping the storm. Expressions of approval have run counter with condemnation—for the original article one moment and subsequent contributions the next. "Mules" have joined company with passages from Latin, "surface tension" and "parts per million" have sat at the same table, and the "last three grains per gallon" have talked the matter over with "sand filters." Truly, even one versed in the technique of such a subject could scarcely avoid floundering, so involved and diversified at this date have things become. Small wonder then if the others, taking their cue from the mariner of Daniel Webster's creation, should stick their periscopes above the turbulent sea of comment and in good old Anglo-Saxon express themselves, "Well, where are we now?"

Consider then the initial article. "Specifically," it was said in the previous editorial, "the article concerns itself with boiler compounds and points out the possibilities of this much applauded and berated and withal too little understood method of improving the locomotive performance in bad water areas." This statement was applicable then and may be reiterated now. And what of the discussion since? Has it made out a case against treating plants as one writer was evidently under the impression the initial article would? Has it dispelled the suspicions concerning boiler compounds as others have apparently entertained fears that it might? It must be confessed that the reflections made against treating plants, considered at least with reference to specific installations, have not been entirely without foundation and it cannot be refuted that boiler compounds have not been divested of all their shortcomings.

But, relieving the voluminous discussion of its many digressions and occasional personalities, does it not give emphasis to the observations made heretofore that there is both merit in boiler compounds and justification for treating plants; and giving due consideration to the very appropriate distinction made in the discussion between anti-scale compounds and anti-boiler compounds and the caution held out against crediting the results obtained by the one upon the ledger of the other, is not the fundamental conclusion to be drawn, still the one previously made that "the problem of improving boiler waters in short is no longer one of arbitrarily installing a treating plant or of prescribing a preparation for locomotive boiler or tender treatment, but rather that of choosing that method which is best adapted to solve the particular problem, whether it be a particular kind of interior treatment alone, a special kind of exterior treatment alone, or a combination of the two." If the discussion has established this impression, the query, where are we now, has been advanced to good purpose.

Fundamental Considerations in Locomotive Operation

IN CONSIDERING the features to be included in new motive power railroad men are generally confronted with conflicting viewpoints. One person may claim that efficiency consists solely in getting heavy train loading and therefore the tractive effort should be made just as great as possible. Another may lay the greatest stress on fuel costs and advocate a design in which fuel economy is given first consideration. Still a third may be most concerned with getting locomotives that will be easy to maintain and make a high mileage on a monthly basis and between shoppings.

All three of the viewpoints mentioned are based on important factors in locomotive operation. No one alone is a safe guide for the selection of economical locomotives but all must be considered jointly to attain the object for which railroad men are striving—minimum over-all cost. The principal difficulty is in giving each its proper importance. Probably the best procedure is to work out estimates of the cost of operation for different designs. This is not always satisfactory because accurate figures cannot be obtained in advance. The whole problem is so complex that it requires careful study. However, a few general principles can be pointed out as a guide toward the desired end.

The cost of operating a modern locomotive of the Mikado type, for example, is about $4.00 to $4.55 an hour for the wages of the enginemen and trainmen and from $9.50 to $19.70 an hour for fuel, or an average for the country of about $11.40 based on a consumption of 6,000 lb. The fixed charges on the train-hour basis will vary with the first cost and the proportion of time in service to total time and will range from $.90 to as much as $5.00 an hour. Repairs will show considerable variation depending on the class of service, water supply and design of the locomotive. An average value would be approximately $5.60 per hour of service.

These figures show that the largest item of expense in the operation of modern locomotives is fuel. Because it is the greatest, it should have first consideration. The boiler and machinery should be designed to get the maximum practicable efficiency. Any device that will save in fuel an appreciable amount over the cost of maintenance and the fixed charges is a money-earner. There is a tendency to hold the dime spent for maintenance so close to the eye that it completely hides the dollar saved in fuel. If every road made out debits and credits for each appliance, there would be more fuel-saving devices applied.

Coming now to maintenance expense, there are three primary items to consider in deciding on the design; repair cost, operating cost and first cost. Reliability is a necessary characteristic of a locomotive and railroad men generally associate reliability with simplicity. The two qualities do not necessarily go together. Perhaps there is room for improvement in mechanical details by refined design that will add to the life of such vital factors as tires, driving boxes and rods.

The greater first cost would not be a serious factor if improved design could either increase the percentage of time the locomotive spent in actual service or reduce the cost of repairs.

The question of wages, which most operating men would probably place first, is only in third place in the items of expense. The reason is that wages no longer afford the major opportunities for saving. A net train load of 500 tons would represent a wage cost of about $0.0008 per ton-mile. With a train load of 1,000 tons, which is conservative for a Mikado locomotive, the cost would be only $0.0004 per ton-mile. Assume that the rated tractive effort can be increased one-fourth. This would decrease the wage cost per ton one-fifth, provided the full tractive effort could be developed and utilized. There would almost necessarily be an increase in maintenance costs for both the locomotive and the cars which would tend to offset this economy. Furthermore, the same gross saving could be effected by an eight per cent decrease in fuel costs as by a 20 per cent decrease in wage costs. This should not be interpreted to mean that possible savings in wages are negligible, but the question goes deeper than mere rated tractive effort. Wages can be saved by speeding up operation as well as by increasing train loads and the minimum wage cost can only be obtained by combining high tractive effort with other features that make it possible to speed up trains and cut down overtime.

The last of the items to be considered is that of fixed charges. Probably many will be surprised to find that in some cases it may amount to more than wages. Perhaps the relative importance of this item can best be illustrated by a comparison with electric operation. The electric locomotive costs probably two and one-half times as much as a steam locomotive of equal power and, furthermore, it requires expensive overhead construction and power stations. In spite of these facts electrification can show savings under favorable conditions because electric locomotives save fuel, reduce maintenance costs and speed up train service. It will pay likewise to spend more money for steam locomotives and related facilities that will accomplish similar results. Railroads have learned to buy coal not on price, but on the basis of heat units or ton-miles per dollar. In purchasing locomotives the measure of value is the same. To be sure, the problem is more complicated, but it is also more important and well worth the attention that is necessary to find the right answer.

New Books

Traffic Management. By George A. Denfield, President and Professor of Traffic Management, Western University of Commerce and Law, Portland, Oregon. 367 pages. 6 in. x 9½ in. Bound in cloth. Published by the author.

The author of this book has taught traffic management in Georgia, Montana and Oregon and he has packed into this book, we should say, every fact bearing on this subject that he was able to gather in all of these states; over 300 pages, with no room wasted. He has posted himself fully and in every detail concerning the operation of freight houses, local and general freight offices, the making of rates and the solicitation of freight; and, as in the case of Goldsmith's schoolmaster, the reader wonders that one head can carry all that he knows.

He has divided the work into five parts and 12 chapters, as noted below; but each chapter contains such a bewildering mass of facts that the only discernable rule for selection or classification of material seems to have been to set the reader to thinking, throughout the whole traffic field, *in each chapter.*

The introductory chapter treats of transportation, from the dawn of civilization; and the geographical study of the United States, occupying 12 pages, is so detailed as to remind one of the celebrated English geologist, who could find his way in a strange county on a dark night by picking up and tasting a lump of earth. The principal traffic routes of the United States are traced from A. D. 1815, down to 1921, and evidence of up-to-dateness is seen in a reference to the anxieties felt by the shippers of hops in the Western states because of the passage of the 18th amendment to the constitution.

The matter in the book is voluminous; overwhelming; not thoroughly digested; a judicious selection would have been more useful. The professor's students are not likely, however, to find in this condition any excuse for neglecting to

give their lessons thorough study for, following the last chapter, there are 75 pages filled with questions; concrete, abstract and mixed. Five hundred and ninety-six of these questions are labeled "Practical Problems." Evidently Professor Denfield has read every one of the freight rate decisions issued during the past dozen years by the Interstate Commerce Commission and has committed them to memory; and the hundreds of knotty problems with which those decisions are sprinkled are here set forth for the perusal of the unsophisticated reader who aspires to fill one of the "thousands" of traffic managerships which large mercantile and manufacturing establishments are now waiting to confer on competent young men at "promising salaries."

Following the "practical problems" there are 825 questions written in the ordinary style, many of them filling but a single line, by which the student can test the degree of success with which he has absorbed the contents of the book. On the subject of freight classification alone there are 300 of these questions; and so far as can be judged by the make-up of the list, or of the chapter to which it refers, the student is expected to answer the whole of them at one sitting!

The only rational conclusion that we are able to reach concerning the scheme of this book is that it is a transcript or revision of all the notes that have been made by the author in an extended experience as teacher or lecturer; made without sufficient attention to the needs of the student, and leaving a considerable task for the teacher who would use the book as a guide. Traffic management is a pretty difficult subject to systematize, and we are not blaming the author of this book for not doing it; but it is only fair to readers to tell them that this mine of useful information contains a large percentage of highly refractory ores.

The author has done well to make himself intimately acquainted with numerous competent railroad traffic officers and he gives the reader the full benefit of their wisdom on a thousand different points; but he too readily follows some of their careless habits in the use of words. Also there are occasional infelicities of language on the part of the author himself, indicating that some of the work was done too hurriedly.

The five parts of the book are entitled; (1) tonnage and rate construction territories; (2) classification; (3) tariffs; (4) transportation services and (5) traffic administration. The first part is divided into (1) introduction, commerce, industry and transportation; (2) physical and productive regions of the United States; (3) channels of traffic and (4) geographical relationship of traffic territories and rate construction points. Part 5, which is chapter 12, deals with administration of both railroad and industrial traffic departments.

Some of the "practical problems" referred to above are notable for their oddity. Others seem to be designed to stump the young student in various ways. Problem No. 13, of part 1, reads: "The southern mountaineer, who is able to grow corn on the mountain slopes claims that lack of transportation is the reason for his moonshining operations and illicit stills; that transportation will not allow him a profit on taking his goods to market. Therefore, he must have a product of high value and low bulk. Do you agree with the claims that are set forth? Will the government's aid and development of dairying and cheese-making improve conditions?"

Under the head of classifications we find, for example: "Classify all athletic, gymnastic and sporting goods for the A. G. Spaulding Company, who desire to open a new store in Pittsburgh, and are planning to ship the goods from either New York or Chicago. Try and show them which would give them the better rating."

Problem No. 147, on page 284, reads: "The speaker on the Socialist program remarked that freight rates on cotton and woolen goods was discriminative, such as ratings on overalls and woolen suits. Show his line of argument and your opinion."

Were it not for limitations of space we could go on indefinitely with illuminating questions and comments concerning race-horses, planographs, garages, nitroleum, Oklahoma basing points, skirt forms with standards detached, proper location of tanneries, rates on human hair, C. L., and proper allowance for outage in tank cars; rates on kitchens, K. D., best place to make crude balsam, how to get a monopoly on the bottle business, how to ship a circus without being troubled by "cooties" and such like—and so on for pages and pages.

One thing that we have not found in the book, but which is of the first importance to the young student of traffic problems, is a warning that very frequently he will find the science of his business not only too complicated and confusing to be kept clearly in mind when soliciting a shipment from an ugly customer, but also too dim and remote to be satisfactorily defined; too much like a radio message from Australia. At the risk of being cited for contempt of the traffic court we will remind the student that, in difficult cases such as are here suggested, a knowledge of what your competitor is doing, or can do, or hopes to do, will often take the place of a great lot of scientific knowledge. Many of the most successful traffic men have had but scant knowledge of traffic science; but they have been adept in the art of guessing the other fellow's thoughts.

Moody's Analyses of Investments, Steam Railroads. By John Moody. 9 in. by 11 in. 1,314 pages. Bound in cloth. Published by Moody's Investors' Service, 35 Nassau Street, New York. Price $20.

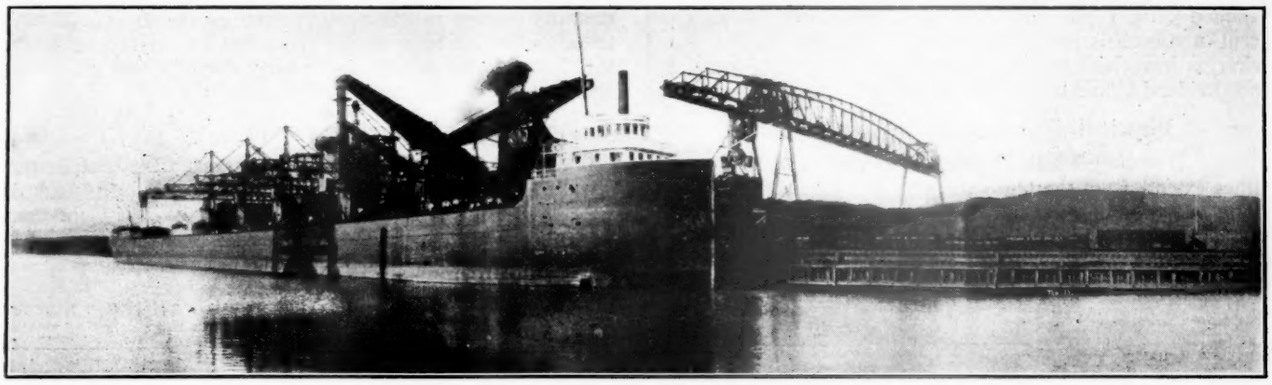
This is a new edition of Moody's Rating Book or Analyses of Railroads. The book combines the features of a manual on railroads with those of a rating book, performing the same function in respect to the investment standing of securities, as the credit agency rating books do on credits. The work, however, goes farther in that it presents the data upon which the ratings are based together with the full descriptions of properties and information regarding earnings, traffic statistics, officers and directors, price range of securities for years and other details of this nature.

All of the financial statements and earnings reports are analyzed. The percentage earned on different classes of stocks is shown, as well as the margin of safety for bond interest, average income available for fixed charges or dividends, with the amount required for such purposes. Comments are given on the equity of security issues and their market ability and other deductions are presented in concise, easily-understood tables.

Thy system of investment ratings is simple, yet specific. Securities of the highest investment character, issues strongly protected by assets and earning power, whose position is secure beyond the shadow of doubt are rated Aaa—the next rating Aa, then A, Baa, Ba, B, etc. Atchison Topeka & Santa Fe General Mortgage 4s of 1995 are rated Aaa; Chicago Great Western First Mortgage 4s of 1959 are assigned a Baa rating; Norfolk & Western Common stock is rated A—Seaboard Air Line, preferred, carries the rating C.

The book covers all railroads in the United States and Canada and prominent South American systems.

For many years Moody's Rating Books have been part of the regular equipment of banks and financial institutions but recently, due to the general interest in railroad securities and railroad operations, the Railroad Rating Book especially has come into greater use upon the part of the public. This book will be found instructive and valuable to anyone who is interested in any phase of the transportation industry. The purchase price of $20, includes also Monthly Bulletins of New and Revised Ratings and Monthly Earnings Reports.



The Ore Dock at Huron

Wheeling & Lake Erie Watches Cost Factors Closely

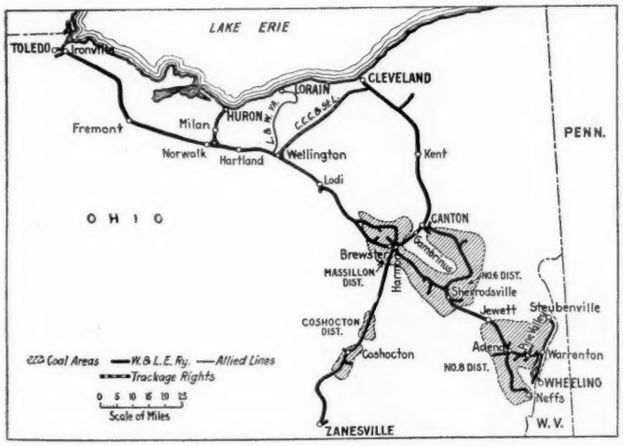
Coal and Ore Traffic Predominate—Road in Much Better Physical Condition Than Formerly

By Charles W. Foss

PART I

THE WHEELING & LAKE ERIE'S net after rentals for the year 1921 was $1,755,356. For 1920 the road had a net railway operating deficit of $401,694. In 1919 and 1918—during the federal control period—there was a net railway operating income of approximately $1,000,000 in each year. The 1921 increase in net was in spite of a sharp falling off in traffic. For the year the net ton-miles, revenue and non-revenue, totaled 1,097,087,936, as compared with 1,580,700,825 in 1920.

The operating ratio for the year was 79.55 per cent, the transportation ratio 38.70. For several months during the middle of the year, the operating ratio averaged nearer 70 per cent and the transportation ratio around 32. These averages indicate economies of a drastic sort. The road in 1921 sharply reduced its expenses for maintenance of way and equipment. It succeeded during 1921, nevertheless, in making substantial improvements to its roadbed. The index to equipment maintenance—the percentage of bad order cars—shows that throughout the year the road's cars were in better shape than the average. For instance, the per cent of bad order cars on February 15 was 8.1; for all the roads on that date, the percentage was 14.5.



The Wheeling & Lake Erie

A number of factors are responsible for the operating economies which have been brought about. One is the careful supervision given to cost factors, particularly, perhaps, with reference to the effort made to keep down overtime. Another is the manner in which the co-operation of the men has been secured by prizes to yardmasters and train and engine crews for good records in operation. Frequent conferences are held for the purpose of bringing about co-operation among the different departments. The practice is to give subordinate officers both information and authority. The terminal trainmasters are especially given real authority, which they use not only in giving service but in securing business from the industries with which they deal.

TABLE I—REVENUES AND EXPENSES OF OPERATION, 1912 TO 1921

Years ending June 30	Coal revenues	Per cent of coal rev. to total	Total freight	Passenger	Total revenues	Total expenses	Net operating revenue
1912	3,157,650	41.92	6,434,094	603,763	7,532,483	5,071,446	2,461,037
1913	3,145,853	40.01	6,767,830	624,376	7,863,676	5,917,942	1,945,734
1914	2,690,441	35.13	6,544,900	621,034	7,658,424	5,296,660	2,361,764
1915	684,550	12.61	4,385,421	553,630	5,428,069	4,039,740	1,388,329
1916	2,447,143	26.65	7,853,269	627,476	9,184,516	5,960,229	3,224,287
Years ending Dec. 31							
1916	2,600,243	25.99	8,520,202	668,642	10,003,608	6,811,735	3,191,872
1917	3,361,086	30.48	9,438,249	630,606	11,028,904	7,378,213	3,650,692
1918	5,399,337	39.72	15,492,264	485,488	13,592,172	11,290,779	2,301,393
1919	4,011,821	31.84	10,682,086	677,876	12,600,840	10,925,716	1,675,124
1920	6,975,411	38.86	11,970,360	895,241	17,952,257	16,125,999	1,826,258
1921	6,561,349	44.36	12,729,201	952,305	14,791,993	11,767,602	3,024,991

The Wheeling & Lake Erie is a comparatively small road in highly competitive territory. It has fallen upon adversity in former years and has been in receivership on a couple of occasions. It was operated by a receiver from 1908 to the end of 1916; it came out of the hands of receivers in considerably better shape physically than it went in, large expenditures having been made from income and from the proceeds of receivers' certificates for grade revision, new yards, engine terminals, shop facilities, etc. When it was reorganized, the new capitalization included, in addition to the

funded debt, 7 per cent cumulative prior lien stock, 5 per cent non-cumulative preferred and common stock. Fixed charges have been earned since with a margin to spare, but no dividends have been paid on the prior lien stock to date.

Physical Characteristics—Maintenance

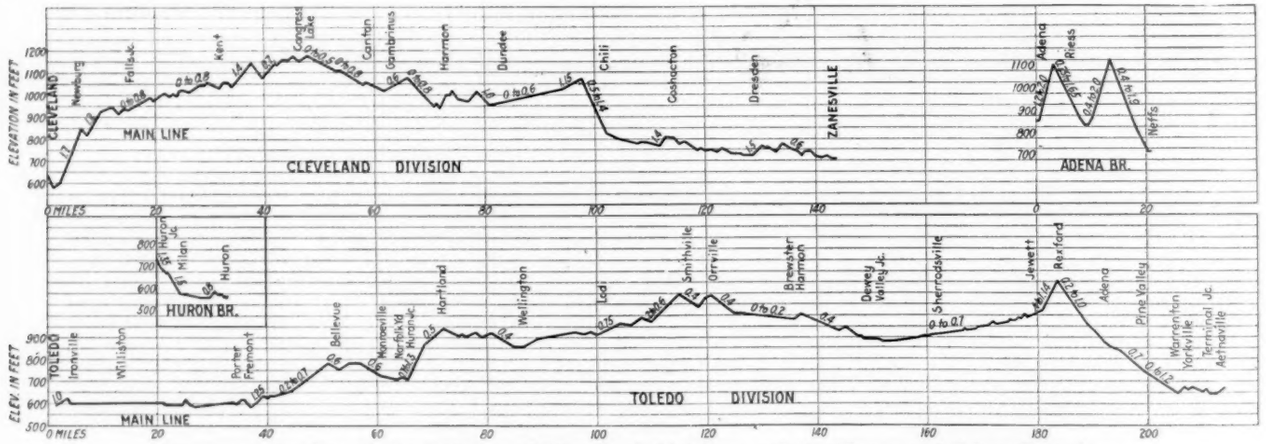
The Wheeling & Lake Erie's mileage totals 512. Its main lines extend from the Ohio river to Toledo and from Cleveland to Zanesville, the two lines crossing each other approximately at right angles. The line from the Ohio to Toledo is the road's main stem. The line to Cleveland is also important, but it is a question if the section extending southward to Zanesville is an important asset of the system. There are various branch lines, as will be seen from the map and the road's strategic position at Toledo, Cleveland and Canton is considerably strengthened by so-called belt lines. The Lorain & West Virginia, Lake Junction to South Lorain, 25 miles, is operated by the Wheeling & Lake Erie and controlled by ownership of practically all the capital stock.

The W. & L. E. is single track practically throughout. The larger part of the line is ballasted with rock or prepared slag. The rail on the main lines is 90-lb. White oak or treated ties are used, the former predominating. Tie-plates are used on all curves and on all treated ties in tangent track. The roadbed at present is in fair condition but not in as good condition as the officers would like to have it. The company contends that the lines were undermaintained during the federal control period. Although the reduction in maintenance expenses which were made during 1921 would hardly indicate it, considerable progress was made in maintenance during the year. Particular attention was given to improving the track foundation and to ballasting in general. The end of the year found the road in much better shape in this respect than it was at the beginning. Illustrations are given of some of the Wheeling & Lake Erie's best stretches of track. The track shown is ballasted with prepared slag. For 1922 the program includes a large amount of tie renewals, the ties for this purpose having already been obtained. A large quantity of new rail is needed; even on the Toledo division there are some rather rough spots due to old rail, although this latter factor is slated for early improvement. Crossing signs, stations, etc., need paint badly.

Equipment

The equipment seems to be in rather better shape than track as is indicated by the percentage of bad order cars on February 15 of 8.1. The road owns 10,126 freight cars, including a large proportion of comparatively new cars. This last is a factor of more than passing interest because it was not so many years ago that W. & L. E. conditions were quite the opposite. The locomotives total 221, including 25 passenger, 33 switching and 163 road freight locomotives. In rating its locomotives, the W. & L. E. has a method whereby locomotives of 40,000-lb. tractive effort are designated 40 per cent engines; of 60,000-lb. tractive effort, 60 per cent., etc., and similarly the locomotives are numbered accordingly. Thus there are 31 Consolidations of 41,360-lb. tractive effort. These are designated 41.3 per cent locomotives and are numbered from 4101 on. Speaking more generally, the freight locomotives include 10 Mallet locomotives of 80,000 tractive effort (80 per cent), 20 Mallets of 84,000-lb. tractive effort (84 per cent), 20 Mikados and 20 Consolidations of 60,000 tractive effort (60 per cent), and various other Consolidations of 30,000; 35,000; 41,360, and 43,000-lb. tractive effort and a number of older Ten-wheel locomotives.

The Mikado and Mallet locomotives are, like a fair proportion of the cars, comparatively recent acquisitions. The Wheeling & Lake Erie was assigned by the Railroad Administration 20 heavy Mikado, 10 light Mallet and 5 Eight-wheel switching locomotives and 1,000 50-ton composite gondola cars, all of which equipment was financed in the general equipment trust covering the standard equipment. During 1920, the road placed orders for 1,000 box and 2,000 50-ton gondola cars, which equipment was financed through the assistance of the National Railway Service Corporation.



Condensed Profiles of the Toledo and Cleveland Divisions and the Huron and Adena Branches

TABLE II—DETAILS OF EXPENSES AND PER CENT OF EACH TO TOTAL OPERATING REVENUES, 1912 TO 1921

Years ending June 30	Maint. of way	Per cent	Maint. of equip.	Per cent	Traffic	Per cent	Transportation	Per cent	Total	Per cent
1912	$876,285	11.63	$1,416,339	18.80	$90,323	1.20	$2,486,731	33.02	$5,071,446	67.33
1913	1,326,299	16.87	1,632,892	20.77	98,280	1.25	2,602,880	33.10	5,917,942	75.26
1914	1,000,063	13.06	1,287,186	16.81	110,185	1.44	2,663,369	34.77	5,296,660	69.16
1915	604,591	11.14	1,043,748	19.23	112,250	2.07	2,088,758	38.48	4,039,740	74.42
1916	1,158,889	12.62	1,757,744	19.14	102,486	1.12	2,741,217	29.84	5,960,229	64.89
Years ending Dec. 31										
1916	1,330,136	13.30	1,982,608	19.82	109,894	1.10	3,159,960	31.58	6,811,735	68.09
1917	1,396,912	12.66	1,677,581	15.21	115,749	1.05	3,904,938	35.41	7,378,213	66.90
1918	2,092,834	15.40	3,201,985	23.56	84,679	0.62	5,555,555	40.87	11,290,779	83.07
1919	2,357,255	18.71	2,999,711	23.81	75,177	0.60	5,100,797	40.48	10,925,716	86.71
1920	3,079,643	17.15	4,581,907	25.52	177,329	0.99	7,826,331	43.60	16,125,999	89.83
1921	1,934,485	13.08	3,429,667	23.19	182,704	1.23	5,724,884	38.70	11,767,002	79.55

The road in 1920 had a debit per diem balance of $1,255,633. The acquisition of this last 3,000 cars put a different aspect on the per diem situation during 1921, the debit that year being $259,643 or nearly $1,000,000 less than in 1920.

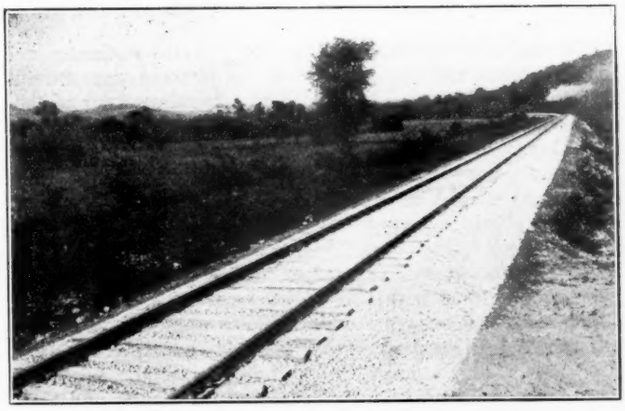
The engine houses as a rule are adequate. Repair shop facilities are located at Brewster and Toledo (Ironville).

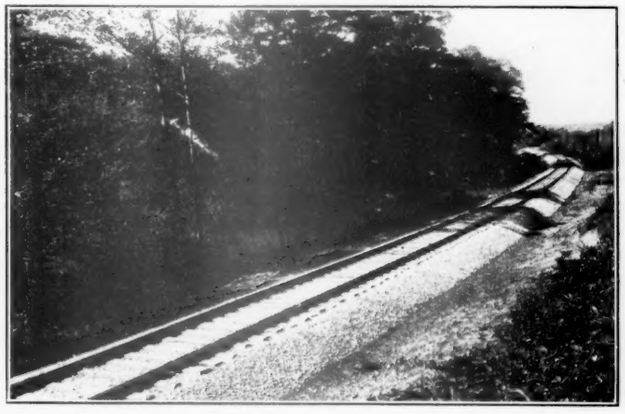
TABLE III—TRAFFIC AND OPERATING STATISTICS

Years ending June 30	Bituminous coal tons	Coke tons	Ore tons	Total rev. frt. tons	Rev. ton mileage	Average haul	Ton miles per mile of line	Net tons per train mile	Net tons per loco. mile	Average tons per loaded car	Miles per car per day
1912	4,877,102	691,942	846,001	10,641,187	1,175,463,368	110.5	2,706,844	733	688	33.25	16.85
1913	5,180,320	941,952	976,758	11,667,451	1,255,099,127	107.6	2,876,338	783	714	34.35	17.89
1914	4,835,603	1,292,903	1,356,706	12,076,785	1,192,862,166	98.8	2,538,701	794	734	35.37	14.52
1915	1,778,129	1,063,690	846,236	8,290,069	651,739,754	78.6	1,352,834	609	569	29.74	10.14
1916	4,443,680	1,117,196	1,834,416	13,877,353	1,302,625,501	93.9	2,635,154	825	757	34.78	18.35
Years ending Dec. 31											
1916	4,647,795	1,062,326	2,059,202	14,856,829	1,428,469,558	96.1	2,880,581	855	777	34.97	17.02
1917	5,084,667	259,933	2,116,767	14,218,970	1,514,181,458	106.5	3,065,956	1,066	940	39.36	13.40
1918	6,281,381	117,083	2,104,624	14,261,519	1,510,350,012	105.9	3,048,095	1,114	969	41.25	12.89
1919	4,270,903	131,828	1,791,399	11,555,433	1,186,471,192	102.7	2,407,970	953	916	40.59	10.36
1920	6,596,663	440,446	2,118,309	14,840,524	1,522,921,850	102.6	3,089,720	1,030	997	42.86	11.76
1921	5,066,212	124,960	993,784	10,269,231	1,045,778,410	101.8	2,144,425	914	868	42.70	13.21

Locomotives are shopped at Brewster and cars receive heavy repairs at Ironville. Both shops are modern and of a good standard. Insofar as concerns the shops at Ironville, however, the criticism might be made that they might be better located if they were at Brewster in the center of things rather than at the extreme end of the line.

The road in recent years has been devoting considerable attention to yards, notably at Canton or Gambrinus and at Jewett. The road is not equipped with block signals nor has it many interlocking plants. Operations are governed entirely by time-table and train orders.





Some of the Wheeling & Lake Erie's Best Stretches of Track

Serves Pittsburgh No. 8 Field

Of the Wheeling & Lake Erie's traffic, about 45 per cent is bituminous coal. There is also a substantial tonnage of iron ore and of various iron and steel products. The road serves four coal fields—the No. 8 Eastern Ohio or Pittsburgh district, the No. 6 district, the Masillon district and the Coshocton district. These four districts are shown on the map. The No. 8 field is much the more important of the four. Coal from it is moved to the various industrial centers served by the road, including Steubenville, Canton, Cleveland, Toledo, etc. There is a sizable quantity used for railroad fuel. Mines on the Wheeling & Lake Erie in the No. 8 district supply coal to such roads as the Nickel Plate, the Erie, the Lackawanna, the Pere Marquette, etc. The larger part of the coal tonnage, however, is moved to the lakes and is dumped into lake vessels at Huron. From Huron there is a sizeable back haul on iron ore—primarily to steel mills along the Ohio river. Some 400,000 or 500,000 tons are supplied yearly to the Canton district. Inasmuch as the No. 8 coal district is at the east end of the line and the larger part of the coal moves to Huron, whereas the ore moves from Huron back to the Ohio river points, the road secures a haul on a large portion of its traffic of nearly the entire length of the line.

The road handles but a relatively small quantity of mani-

TABLE IV—CORPORATE INCOME ACCOUNT, 1912 TO 1921

Years ending June 30	Net operating revenue	Taxes accrued	Operating income	Other income	Gross income	Hire of equipment	Rentals	Interest accrued	Net income
1912	2,461,037	367,225	2,093,812	24,708	2,118,520	268,353	90,574	1,041,126	718,117
1913	1,945,734	362,426	1,583,308	31,102	1,614,410	325,928	83,571	1,091,905	113,005
1914	2,361,764	396,831	1,964,933	63,369	2,028,301	303,985	57,734	1,196,602	469,981
1915	1,388,329	385,907	1,002,422	20,273	1,022,695	187,665	53,065	1,129,105	def. 347,140
1916	3,224,287	452,393	2,771,894	36,947	2,808,841	372,829	104,556	1,130,359	1,201,097
Years ending Dec. 31									
1916	3,191,872	561,118	2,630,754	57,296	2,688,050	402,552	117,146	1,128,218	1,040,134
1917	3,650,692	612,387	3,038,305	171,625	3,209,930	929,678	66,862	1,099,496	1,113,895
1918	2,301,393	694,017	1,606,736	161,983	1,768,719	577,119	37,961	1,187,754	def. 34,115
1919	1,675,124	748,692	924,145	186,094	1,110,239	44,794	31,099	1,205,163	def. 170,817
1920	1,826,258	939,144	885,451	155,097	1,040,548	1,255,633	31,512	1,470,146	def. 1,716,743
1921	3,024,991	1,064,972	1,960,019	136,684	2,096,703	259,643	23,521	1,448,103	365,436

Figures for 1918, 1919 and 1920 represent consolidated corporate and federal accounts with inter-account items eliminated. The Wheeling & Lake Erie's standard return for operations under federal control was $1,586,037. Corporate income account for 1918 shows a net corporate income of $300,295; for 1919, $306,636, and for 1920, $56,725. The 1920 corporate accounts include tentative figures of $264,340 for compensation for January and February, and $1,458,622 for guaranty

fest freight. A small road in highly competitive territory has both its advantages and its disadvantages. One of the advantages is the better supervision permitted. This is a real asset when it comes to service and is of value as concerns ordinary freight service as it would also be in the case of manifest service. The Wheeling & Lake Erie is not a rich road, and it is far from being extravagantly provided with terminal facilities at the competitive centers, although its several belt lines do help it measurably. The road's ability to give service and the supervision which brings about this ability are outstanding factors in the work which the road is doing in these competitive centers, both as applies to coal and ore traffic and to traffic in manufactured products.

Back Haul on Iron Ore from Huron

The total tonnage handled by the Wheeling & Lake Erie approximates 14,000,000 tons annually. The bituminous coal tonnage fluctuates considerably and runs from 4,000,000 to 6,000,000 tons. Ore totals about 2,000,000 tons. The road formerly handled a heavy coke tonnage, sometimes over 1,000,000 tons annually, but in recent years this traffic has become of less importance. In 1920, in which year the road handled more ton-miles than in any previous year, the total tonnage of all commodities was 14,840,524. Of this, coal made up 6,596,663 tons; ore (including ore concentrates) 2,118,309 tons; coke, 440,446; products of mines, as a whole, 9,988,200, and manufactures, 4,114,402 tons.

The relationship between the tons of coal carried and the tons of iron ore is an important factor. The road as has been noted, carries the larger portion of its coal to Huron where it is dumped into lake vessels. From Huron there is a back haul on ore, which movement utilizes equipment which otherwise would return empty. The facilities at Huron include for handling coal, two car dumping machines and for handling ore, four of the so-called rapid unloading machines and two Hulett unloaders. An illustration shows the ore dock in operation. There is, of course, also a large storage space and facilities for handling ore which is to be stored, as will also be seen from the illustration. The pier is of wooden construction and the road is now replacing it with concrete, one-third to be finished by the opening of the lake season.

The coal dumped into vessels at Huron during the 1921 season held up fairly well as compared with 1920 or 1919 as was the case at most of the other lake piers. In 1921, the coal dumped by the Wheeling & Lake Erie at Huron totaled 1,622,968 tons; in 1920, it was 1,958,446, and in 1919, 1,488,516 tons. By the way of comparison, it might be noted that several piers on Lake Erie dumped over 2,000,000 tons in this period, notably the Baltimore & Ohio at Toledo and Lorain; the Pennsylvania at Cleveland and Ashtabula. The Hocking Valley at Toledo dumped over 4,500,000 tons.

The ore received at Huron during 1921 totaled 624,744 net tons; the road shipped from Huron 625,768 tons and on January 1, 1922, it had on its dock 758,676 tons. The ore business was at a low ebb in 1921 because of idleness in the steel industry. This is evidenced by the fact that the shipments of 625,768 tons from Huron in 1921 compared with 1,060,602 net tons in 1920. The W. & L. E. also handles ore from South Lorain and Toledo, although not over its own piers. Shipments from the three ports, Huron, South Lorain and Toledo in 1921 totaled 986,475 tons as compared with 2,074,208 tons in 1920. The figures showing ore shipped and those relating to coal dumped will give a ready comparison of the relative importance the ore traffic plays from the standpoint of supplying a back haul from the lake.

THE CONSUMPTION OF FUEL OIL in 1921 by locomotives of the railroads in the United States amounted to 38,824,000 barrels as compared with 45,847,000 barrels in 1920. Of the total now reported, 27,615,000 barrels were domestic oil and 11,209,000 barrels were Mexican.

B. M. Jewell Attacks Legality of Wage Conferences

WHETHER OR NOT PROPER conferences preceded the submission of the present wage controversy to the Railroad Labor Board has, during the past week, been made the issue in this controversy rather than the justness and reasonableness of the wages proposed by the carriers. For several days B. M. Jewell, president of the Railway Employees Department of the American Federation of Labor, has been reading extracts from the stenographic reports of the conferences held on various railroads, drawing from this testimony the inference that the procedure outlined in the Transportation Act and ordered by the Labor Board has not been followed, and that practically all of the railroads, parties to this dispute, are not properly before the Board.

On March 20 Mr. Jewell completed the presentation of evidence of this character and called upon the Board to render an immediate decision as to the legality of the conferences and to remand the whole controversy over wages to further negotiation between the carriers and the employees involved. In closing his arguments, he said in part:

"We are firm in the conviction that I have presented a picture of what efforts were made by the railroads to confer with representatives of their employees; that we have justified and proven conclusively that Section 301 of the Transportation Act has not been complied with; that there are no disputes, so far as the shop craft employees are concerned, the merits of which this Board can lawfully pass upon in these hearings."

The answer of the railroads to Mr. Jewell's testimony on the question of the legality of these conferences was started on the same day when J. L. Coleman, general attorney of the Atchison, Topeka & Santa Fe, read some correspondence between Mr. Jewell and the members of the Federated Shop Crafts containing specific instructions as to how and when negotiations should be conducted with representatives of the carriers. He drew from this correspondence and from other material the inference that "there is no possibility that those men (representatives of the Shop Crafts) could sit down and negotiate questions with the management."

Regarding the excerpt from the stenographic report of the conferences held between employees and the representatives of various railroads, Mr. Coleman developed the fact that Mr. Jewell had read only portions of these reports and produced as the first witness for the carriers, H. T. Dick, general solicitor of the Chicago & Eastern Illinois, who immediately proceeded to read the many portions of the stenographic report of the conference on that road which had been omitted by Mr. Jewell, and which showed that the questions of cost of living and wages in other industries and similar relevant factors had been discussed at these conferences.

Similar testimony was presented by J. L. Coleman, general attorney of the Atchison, Topeka & Santa Fe, and J. A. Cochrane, assistant to the vice-president of the Great Northern, appearing on behalf of the Spokane, Portland & Seattle, in defence of the conferences held between these roads and representatives of their shop employees. It was shown by the reading of omitted portions of the stenographic report of these conferences that there had been a bona fide effort to discuss present and proposed wage scales.

In response to a request of Mr. Jewell, Mr. Higgins read a list of 19 roads in Western territory which are pleading financial inability to pay the present wage scales as part of their presentation on behalf of lower rates of pay. These carriers include the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the International & Great Northern, the Minneapolis & St. Louis, the Minneapolis, St. Paul & Saulte Ste. Marie, the Missouri Pacific, the Texas & Pacific, the Toledo, Peoria & Western and the Western Pacific.

Telegraph and Telephone Section March Meeting

Reports Set Limits on Clearance at Wire Crossings and Explain the Proper Use of a Transmitter

THE FIFTH SESSION of the Telegraph and Telephone Section, American Railway Association, was opened at the Hotel Jefferson, Richmond, Va., on March 21 by an address of welcome by George Ainslie, Mayor of Richmond. The committee of direction, in its report, told what action had been taken regarding the specifications and recommendations presented to the section. The standing committees appointed last September for handling the work for this year were announced and a memorial in memory of E. A. Chenery of the Missouri Pacific was presented. Additional reports on creosoted poles, reinforced concrete poles and permanent pole lines and tools and equipment were presented at the first day's session. The report on wire line crossings brought out considerable discussion before its adoption.

Construction and Maintenance—Outside Plant

Committee 1, of which G. A. Cellar, general superintendent of telegraph, Pennsylvania System, is chairman, presented new specifications on pole line construction in which it was recommended poles shall be set so that the minimum horizontal clearance of any wire, guy or other attachment will be 8 ft. from the outer edge of the nearest main track rail. Under normal conditions with poles carrying ten-pin cross arms, this minimum clearance will be obtained by setting the poles 13 ft. from the rail. The lowest crossarm should be not less than 25 ft. above the rail.

At sidings, poles may be set with a minimum horizontal clearance of 7 ft. from the outer edge of the nearest track rail. At railroad crossings clear headroom between the lowest wire or cable and the top of the rail shall be not less than 27 ft., except where the wires for cables are paralleled on the same highway by a trolley contact conductor on a lower level, in which case the clearance between such wires at the top of the rail may be reduced to 25 ft. Lines along highways or city streets shall have a minimum clearance above the ground of 18 ft. If telegraph and telephone lines, parallel supply lines (electric light or power) a minimum separation equal to the height of the taller lines should be the minimum between the two systems. A clearance of at least 4 ft. from trees and other brush should, where practical, be provided.

The sub-committee on "Wire Crossings" has co-operated with the public utilities companies and the state commissions in the production of specifications which will be satisfactory to all concerned. As a result of their deliberations it has been agreed that where the sum of the distances from the point of intersection to the nearest supporting structure of each span does not exceed 100 ft. the minimum clearance at the point of intersection or between communication lines and power supply lines, carrying from zero to 750 volts, must be not less than 2 ft. However, if the power lines carry over 750 volts the clearance must be 4 ft. or more. At wire crossings a 50 ft. pole must be set 7 ft. in the earth or 4½ ft. in solid rock. Poles of other lengths are set to corresponding depths. The minimum sag for No. 6, A.W.G. bare hard-drawn copper wire is set at 4 in. for a 100 ft. span at 40 deg. F. and the sag for other lengths of span and different degrees is given in a table in the report. According to the report of the sub-committee on "Transposition" the locations of the poles on which the transpositions are made are to be marked with letters 2 in. high and 2 in. wide, painted on the poles at a height of 5 ft. from the ground. The sub-committee on "Underground Construction" offers detailed drawings and specifications for a mandrel for underground conduit testing and construction.

Construction and Maintenance—Inside Plant

This committee with W. Rogers, telegraph and telephone engineer of the Missouri Pacific, as chairman, presented a report including a specification for lead sheathed office cable, non-quadded, with a twisted pair of cotton or silk and cotton covered enameled No. 18 A.W.G. conductors. Drawings and specifications for cross connecting rings, porcelain fuse blocks with fittings and porcelain terminal blocks are also included in this report. The report of sub-committee "H," included diagrams showing the location and layout for the operator's table, wall panel and test connections in telegraph and telephone way offices, station buildings and interlocking towers. In this work the committee co-operated with the Signal Section to provide space for interlocking apparatus.

The installation and maintenance of caustic soda cells and storage batteries was explained in detail, by chemical equations, diagrams and photographs in the report of sub-committee "K." This report also included a table record form for recording the assignment of wire in cables. The reports of sub-committee "J"—Circuits and Current Supply—included a complete revision of the specification for wire chief's equipment and the routine in railroad offices which was submitted for discussion at the September, 1921, meeting and now incorporates suggested revisions made at that time.

Message Traffic

G. H. Hood, superintendent of telegraph of the Chicago, Rock Island & Pacific, presented the report of this committee. The committee does not recommend the interchange of traingrams between railroads as a general practice because of the fact that the postal laws do not permit intermediate handling of railroad mail; also that traingram service, in order to be dependable, must have close supervision at transfer points and that an additional messenger would have to be employed. As traingram service is primarily an over-night proposition, it is doubtful if the interchange service would meet these ends. Exhibit "E" of this report offered the recommended routine for handling telegrams by telephone. In transmitting numbers each figure shall be given separately by name; for example, $345 in the original copy will be passed over the wire as ("Figures") "dollar sign, three-four-five, three hundred and forty-five dollars." Words having similarity of sound must be spelled and each word pronounced after it is spelled. Guard words are found to be of advantage in identifying the letters of the alphabet. For example, A for Adams, B for Boston, O for Ocean, etc.

Telegraph and Telephone Transmission

This committee, of which Stanley Rhoads, telegraph and telephone engineer of the New York Central Lines, is chairman, presented interesting information on telephone transmission, including the effect of resistance, inductance, electrostatic capacity, leakage, cross talk, and noise. The incorrect use of the telephone, especially the failure to have the speech actuate the diaphragm to the best efficiency, can be corrected by educating the users. Losses in transmission equivalent to 3½ miles of cable are caused by the lips being placed ½ in. from the mouthpiece and of 5½ miles by a distance of 1½ in. from the transmitter.

Telegraph and Telephone Development

This committee reports that an automatic electric lighting outfit for camp cars has been developed which greatly reduces the fire risk from oil and gas lamps for isolated quar-

ters and camp cars. This outfit consists of a small gasoline engine connected to a motor which develops 110 volts and current to light twenty-four 25-watt lamps. Interesting information is also given on the reclamation of exhausted dry batteries. It is found that salt, and also salammoniac, if dissolved in the water in which the cells are placed, will cause the cells to recuperate and last a day or two longer.

One trunk line railroad has made use of a frequency doubling coil arrangement to increase a 110-volt, 60-cycle, a.c., single-phase power to 120-cycle for use with composite ringers. This arrangement is considered to be a desirable improvement over the composite ringer operating with the interrupter unit as a means of eliminating battery units with its moving parts.

Reports of Other Committees

An organization chart is presented and explained in detail in the report of the committee on Rules and Organization, describing the various employees and the duties of each man necessary to the proper handling of telephone and telegraph equipment on the modern railroad. The duties of the superintendent of telegraph, the telegraph and telephone engineer, chief dispatcher, supervisor, chief inspector, chief lineman, etc., are each explained in detail in order that there will be no overlap in the carrying out of their several duties.

The report of the committee on Radio and Wired Carrier System gives the details of the test made last November on the New York Central at which time the carrier-current apparatus was tested successfully on a 600-volt trolley wire system. Buzzer signals were sent out from the sub-stations and were received by loud speakers in the waiting rooms or on moving trains and could be heard some distance away.

The committee on Education and Training of Telegraph and Telephone Employees has outlined a definite course of instruction. While it will generally be necessary to employ the correspondence method, due to the character of the work and the location of the employee, better and more immediate results will be obtained where the courses can be administered under the direct supervision of an instructor. It is the intention of the committee to suggest to engineering schools subjects that might be well taught in order to prepare trained men to enter the telegraph and telephone field after graduation. Among the problems with which the department has to deal are transmission, design of circuits, specifications and tests for construction and maintenance material, electrolysis, etc.

Warfield Warns Against Attacks on Transportation Act

WASHINGTON, D. C.

THE NATIONAL ASSOCIATION of Owners of Railroad Securities has issued a pamphlet analysis of the Supreme Court's decision in the Wisconsin rate case, by S. Davies Warfield, its president, which views with alarm (although it is stated that no criticism is intended) current reports "that railroads are preparing to attempt to enjoin the commission from putting into effect the division of the excess revenue provision of section 15-a of the Transportation Act." "The fatal consequences that must attend the mutilation of section 15-a," he says, "have been shown and made clear by the Supreme Court's decision," and "it cannot be supposed that the excess earnings provision of section 15-a can be shot to pieces by opposition of individual railroads affected and that the carriers will still be left in unlimited possession of the benefits of section 15-a. This section, which formed the basis for the Supreme Court's decision, cannot survive unless the railroads themselves show a proper conception of the national public interest on which it is based."

Important as the decision is in defining the relation of the Interstate Commerce commission and of the state commissions to the adjustment of railroad rates, Mr. Warfield says, even more important is the basis upon which the court reached a unanimous conclusion fully sustaining the broad purposes of the revenue provisions of the Transportation Act as embodied in section 15-a. After calling attention to the fact that this section represents the rate-making principle advocated by the association, which included provision for the disposition of the excess revenue to be produced, Mr. Warfield says that the association's counsel, in the brief submitted to the Supreme Court in this case, had attached fundamental importance to the percentage rule of rate-making in 15-a as justifying the commission's action in advancing state rates. He intimates that counsel for the railroads had rested in the contention that the commission had ample authority for its orders under the so-called Shreveport power to deal with discrimination, without reference to 15-a, and points out that the court held that the "sweep of the order" could not be sustained on the showing of discrimination against persons or places alone and had based its decision on the necessity for adequate revenues to sustain the national transportation system.

"It was plain to counsel for the association of security owners," he says, "that the commission's orders relating to interstate fares in Wisconsin could not be sustained on the sole theory of discrimination as against individuals and localities, familiarly known as the doctrine of the Shreveport case. It was considered that not only would the case be lost, but that the broad principle of carrier revenue and the group or national consideration underlying section 15-a would be jeopardized unless the case were decided on broader grounds.

"The court recognized that section 15-a brought into the regulation of transportation for the first time in any effective way the element of revenue consideration. The court refers to this new element as the 'most important purpose of the legislation.' The chief purpose was to provide sufficient revenue to conduct transportation as a whole, in the public interest, and to prevent interference with this result on the part of either a state or a railroad.

"This problem of rates to sustain a national railway system without yielding to certain minority carriers in the system more revenue than the public and public authority will stand for, was the problem of the Transportation Act, solved by section 15-a. It is based on the division of that surplus revenue produced by rates adjusted to the necessities of the majority carriers which, for convenience, was designated 'excess earnings'—as a matter of fact, a misnomer. It is not earnings. It is a by-product arising from revenue necessities. If the state cannot obstruct the authority of Congress to sustain the national character of an interstate system of transportation, it is obvious that no railroad forming a part of this system can obstruct that result by contending that rates must be allowed to each carrier in its sole right and free from adjustment of revenue in excess of its individual right.

"The full revenue produced would not have been allowed the minority carriers if rates had been made for them alone, and the excess is subject to such disposition as Congress may make of it in the general public interest in transportation—provided a reasonable return is allowed on the property of the particular carrier affected by the administration of the act. If it were practically possible for the commission to make rates for each of these minority carriers alone, there is no reason to assume that the rates thus made would yield a return greater—perhaps not as much—as these same carriers may be expected to receive as a reasonable return on their property devoted to the public use under the provision of section 15-a of the act, with a division of excess allowed.

"The court's decision places railroad policy in a new and significant position. It means that private ownership of railroads can only survive if the carriers are willing to acknowledge themselves as part of a national railway system. But if aid is lent to assaults on section 15-a, through repudia-

tion of the national aspects of the subject established by unanimous action of the Supreme Court, that section will go out of existence and private ownership will go with it.

"The question now is whether the railroads will themselves attempt to nullify the first and only constructive and remedial legislation adopted by Congress in their interest and for their protection since 1884, by disrupting the basis on which that relief has been granted; a national system of transportation of which all essential carriers are parts.

"Should it come to pass that the necessities of transportation would force the government to take over a number of railroads, the position of the remaining carriers would be precarious. In the contingency of government operation, arising out of the necessity to maintain essential systems, it is a grave question whether it would be possible for the remaining railroads, in competition with the government, to meet operating conditions that might be forced upon them."

The second part of the pamphlet also refers to the car pooling plan proposed by the association's board of economics and engineering, and says that after the recent appearance before the commission of the representatives of the association, statements were immediately made that the existing railroad agencies have been bringing or can bring about the freight car economies that were suggested, without pooling. "It was pointed out in the statements," Mr. Warfield says, "that these agencies were co-operating with the commission and through the powers given the commission by the Transportation Act to re-allocate freight cars in emergencies, the service and economies which the suggestions contemplate could be obtained."

Mr. Warfield also says that the association had requested certain information for its study of the question of consolidations in September last from all Class I roads, but that while 70 important carriers, constituting about 40 per cent of the mileage, have been very prompt in their responses and have furnished important data, 67 declined to give the information and the remaining 68 have not been heard from, "leaving the supposition that the information asked will not be forthcoming." He says that in recent appearances before the commission, the association's representatives stated that it was believed that more effective and immediate results can be obtained by consolidating or extending the joint use of railroad facilities rather than by attempting to consolidate their corporate organizations at present. The board will shortly make a report in respect to joint terminal uses.

Mr. Warfield also refers to reports that railroads would attempt to enjoin the commission from putting into effect the division of rates between the eastern and New England carriers recently ordered by the commission. He says that without entering into the merits of these cases it seems plain that suits of this nature would be contrary to the spirit and purpose of the Transportation Act and contrary to the Supreme Court's clear recognition of the relation under Section 15-a of each railroad to the transportation systems as a whole. He says the right of any railroad to test the reasonableness or application in detail by the commission of the basic principles of the Transportation Act is not questioned. What is questioned is the propriety or expediency of the attack upon those principles which in themselves are vital to the welfare of the railroads.

Maine Central Shows Deficit of $2,165,362

State of Maine Excise Tax Big Factor. Lower Wages and Fuel Costs Indicate 1922 Improvement

THE MAINE CENTRAL is the first Class I carrier to make public its annual report for the year ended December 31, 1921. The report is further of interest because the road is the first of the New England carriers to make public its figures for the period in question.

The Maine Central did not succeed in 1921 in overcoming—to put it in its broadest terms—the fact that it is a New England carrier. The road had a deficit, after a payment of interest, of $2,165,362. In 1920, when it was able to rely upon its standard return for two months and its guaranty for six, it showed a net of $304,433, out of which and from surplus, it paid dividends of five per cent on its preferred stock and six per cent on its common, which dividends totaled $653,166. In 1921 no dividends were paid.

One of the Maine Central's handicaps is, as has been pointed out in these columns before, that it has to serve more or less in the role of Atlas for the financial structure of the state of Maine. Whereas Atlas had the task of supporting the world on his shoulders, the Maine Central has to help support on its shoulders the state's finances. This is due to the excise tax. In 1920 the road's total of taxes, including federal taxes, was $1,163,289. In 1921 it had to pay $1,263,982. Of the 1920 taxes the state of Maine's excise tax constituted $795,907. The excise tax in 1921 totaled $972,863. The total tax increased $100,694, but the excise tax increased $176,956. It has been stated on more than one occasion that relief for the railroads of New England should come from the people of New England. The *Railway Age* does not necessarily agree with this view, but it is to be feared that the people who express it may find considerable material for their suggestion in this excise tax situation.

The question that naturally arises in reviewing an annual report of a railroad like the Maine Central is its prospects for the coming year and whether it is going to succeed in overcoming the disadvantages which now confront it. One would naturally expect that the recent decision in the New England's division case should permit the road to make a better showing for 1922 than for 1921, although the threatened litigation still leaves that uncertain. Other factors that will have an effect are the decrease in wages and the lessening cost of fuel.

The operating expenses for the railroad in 1921 showed a decrease from 1920 of $3,141,771 of which $114,553 was maintenance of way; $347,284 maintenance of equipment and $2,571,823 transportation. Insofar as concerns the decrease in transportation expenses, one notices particularly the decrease in wages and a decrease of $1,136,075 in fuel for train locomotives. Of course, part of this decrease in fuel expenses is due to the smaller amount used because of the lesser traffic, but the principal reason is the lower unit cost. The expenses for maintenance of way indicate that the railroad in 1921 paid considerable attention to maintenance. Increases are shown for the items of cross ties and rails particularly. In 1921 the road laid 6,923 tons of new 85-lb. rail and put in track 537,123 ties. These figures represent a considerable increase over those for the other years for which figures are available, as is shown by the following tabulation:

Year	Rail Tons	Ties Number
1916	6,173	395,965
1917	2,669	137,790
1920	4,689	355,020
1921	6,923	537,123

The year 1921 also evidenced considerable progress in the matter of shop facilities. The new machinery was installed

in the car repair shop at Bangor, greatly improving the facilities at that point. Several new machine tools were added at Waterville and a new 85-ft. turntable was installed at Rockland. During the year the car repair shop at Rumford and the enginehouse and shop at Calais were destroyed by fire. The facilities at Calais were replaced by an 8-stall enginehouse and a modern repair shop of brick construction which were completed and put in service late in the year. Plans have been made for a new shop building at Rumford but its construction has been deferred for the present.

The freight revenues of the Maine Central in 1921 totaled $14,275,951, as compared with $14,331,295 in 1920. In 1921 the total revenue tons of freight carried were 7,027,505 as compared with 8,753,065 in 1920 and the revenue tons one mile were 787,141,374 in 1921 as against 948,186,188 in 1920. Thus there was a decrease of 20 per cent in revenue tons and 17 per cent in tons one mile. The reduction was primarily due to the small amount of traffic in the paper and lumber industries. There was also a considerable decrease in tonnage of products of mines but a considerable improvement is noted in the traffic in the products of agriculture although not sufficient to balance the decrease in other respects. The passenger revenue for 1921 totaled $4,909,998 as compared with $5,394,285. There was a decrease in passengers carried and passengers carried one mile of 20 per cent.

The Maine Central has many branch lines and is in a position where it is not able to secure a heavy train load or a heavy traffic density. Its net tons per train, including both revenue and non-revenue, were only 375. Its net tons per loaded car were 22.2 and its net ton-miles per train hour, only 4,206. Its car miles per day were 16.5. According to the December monthly statement to the Interstate Commerce Commission the road had a deficit after rentals of $466,962 in 1921 as compared with a deficit of $2,573,706 in 1920. This indicates that there was improvement in 1921 but unfortunately this improvement is not reflected in the corporate net after interest charges, because the 1920 corporate income account as above noted included standard return for two months and guaranty for the guaranty period.

Electric Switching Service on the New Haven

By F. W. Carter
Westinghouse Electric & Manufacturing Company

ELECTRIC SWITCHING LOCOMOTIVES are used in four freight yards on the New York, New Haven & Hartford. When the yards were electrified, every three electric locomotives replaced five steam locomotives which had been used for switching service.

The sixteen 80-ton electric switching locomotives are of the single-phase, 25-cycle, 11,000-volt, alternating-current type, having two articulated trucks. The over-all length of these locomotives is approximately 37½ ft. They have a tractive effort of about 23,200 lb. with a horsepower rating of 752, and a maximum speed of 25 miles per hour. Each locomotive has four motors geared to the axles. The diameter of the drivers is 63 in.

Five of these locomotives are located at the Oak Point yards, two at the Westchester yards, two at the Stamford yards, three at the Harlem river yards, one used for transfer of freight on the New York, Westchester & Boston Railway, and the remaining three held at the shops for inspection or use at whatever point the service demands.

The three main electrically equipped yards on the New Haven are the Oak Point yard, having a length of about 37 miles, with a total of 35.5 miles of electrified track; the Harlem river yard, having a length of about 23 miles; and the Westchester yard, with about the same trackage as the Harlem river yard.

The number of electric switching locomotives assigned to the Oak Point yard varies at times from five to seven, according to the amount of traffic to be handled. The locomotives in this yard are used in two different classes of service, four of them being assigned to what is known as "float yard" service, to unload eastbound cars from the floats and to load westbound cars on floats, and also to do whatever switching is necessary with the westbound cars. The New Haven has approximately 16 tug boats with from 350 to 1,200 horsepower each for transporting the freight cars between the terminals by floats, the floats having a carrying capacity of from 12 to 22 cars each. The fifth locomotive used in these yards takes the eastbound cars from the float yard to the classification yard and makes up the eastbound trains. In looking over the records one month was selected as a representative month, which showed an average of 43 floats handled daily at the Oak Point yards. With an average tonnage of 900 for the eastbound float loads, and 600 for the westbound, the four locomotives assigned to the float yards handle approximately 16,000 tons each in a 24-hour service. The locomotive working in the classification yards handles about 75 per cent of the eastbound cars received, the other 25 per cent being taken to the Westchester yards by the transfer engines. This makes the average daily tonnage for these locomotives approximately 18,000. In addition to loading and unloading the floats the four locomotives in the float yard do a certain amount of switching of westbound cars and various miscellaneous work in the yards. The figure of 18,000 tons, therefore, seems to be a very fair average tonnage for the locomotives working in this yard.

The following is the monthly mileage made by some of these locomotives in switching service:

Locomotive No. 0202 — 4,356 miles per month
Locomotive No. 0203 — 4,446 miles per month
Locomotive No. 0204 — 4,392 miles per month
Locomotive No. 0208 — 4,320 miles per month
Locomotive No. 0214 — 4,404 miles per month

The locomotives are kept in service 24 hours a day by using three 8-hour crew shifts, and after the completion of 2,500 miles they are sent to the Van Nest shops for a light inspection. A day force working eight hours is employed for locomotive inspection and the work is usually done at the rate of two locomotives per day.

A number of these electric locomotives have made records of 24 hours a day for 30 days without any interruption.

The principal advantages ascribed to electric locomotives in switching service are that they conserve the fuel supply, affect car-mile economies, expedite the operation of trains and reduce the number of locomotives required to do the work.

Photo by Kadel & Herbert

Passenger Station at Genoa, Italy

A Means of Determining the Average Life of Ties

An Explanation of the Fluctuations in Requirements on New Lines and a Method of Anticipating Them

By V. K. Hendricks

ONE OF THE VEXING problems that is ever with the railroads is the determination of the average life which is being obtained from cross-ties. Because of the many factors which affect the question, this determination is frequently not susceptible to exact solution, and at best the results will often be an approximation. Records are not always available covering tie renewals over a sufficient period; the tie renewals are frequently affected by the financial situation of the railroad at times, thus making an ab-

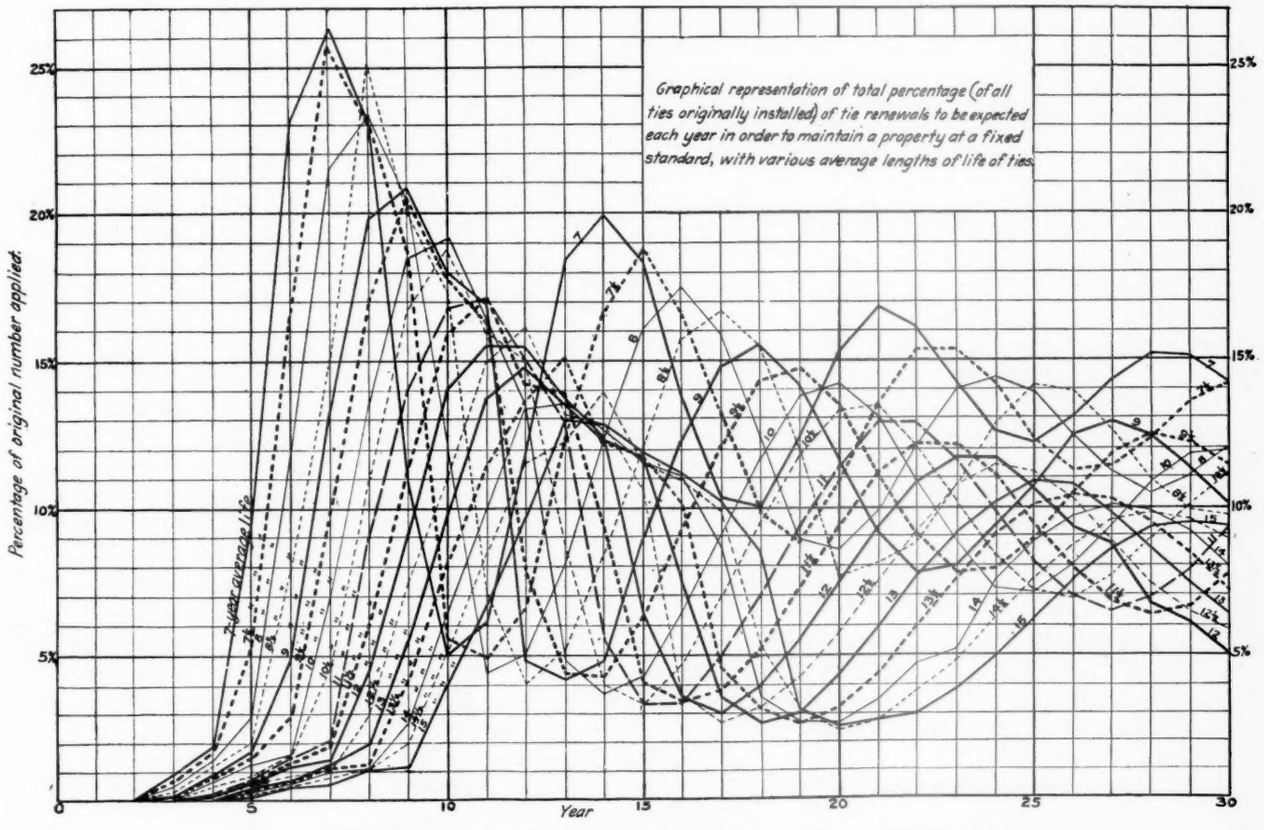


Plate 1. A Chart of Annual Renewals in Per Cents of Ties Originally Installed

normally light renewal in some years which must be made up in others; the mileage does not always remain uniform; a change in the standard of maintenance sometimes occurs, due to a change in supervision or in traffic conditions; and a change is sometimes made in the kind of ties used—all of which complicates the problem. In all such cases the best that can be done is to see that the method used in the determination will give the closest approximation possible to the true average life at the time of the investigation.

Some years ago considerable expenditures were made by many lines for the purchase and application of dating nails so that accurate records of tie life could be procured. This practice, however, was generally abandoned after a few years' trial, partly because of the expense but mainly due to the fact that, for various reasons, the results obtained were not dependable. Recourse was then taken on a number of lines to the establishment of test sections of track, with careful records of each original tie installation and reliable inspection and records of all renewals within each section. This method will probably give more reliable results than the dating of all ties in track, but it will require time to secure results and a very large number of each of the kinds of ties must be included in the test sections in order to determine accurately their average life.

A comprehensive study of the cross tie situation on a railroad necessitates the closest practicable determination of the average life of ties; without this information their relative economy as compared with other kinds of ties cannot be ascertained. Anything which will aid in securing a reliable average or a closer approximation to the true average life, is, therefore, of material value.

Some four years ago Mabel E. Thorne, statistician of the U. S. Forest Products Laboratory, made a study of the "Relation between Average Life of Ties and Percentage of Renewals," and in January, 1918, presented the results in a paper before the American Wood-Preservers' Association. It was based on records, collected over several years by the Forest Products Laboratory, of tie replacements and removals, covering 12,185 untreated and 30,751 treated ties, or a total of 42,936 ties, and is the best information available on that subject. Her results then indicated that the

renewals in proportion to the average life are the same for untreated ties as they are for treated ties, and reliable records on some 43,000 ties should afford a very close determination of the law governing the rate of tie failures.

To make this valuable data readily available for the determination of the average life of ties on roads not over 30 years old, Tables I, II, III and IV have been prepared, covering average tie lives of from 7 to 15 years inclusive, and varying by one-half years. Table I shows the percentage of failures each year during the life of all of the original ties—that is, it does not provide for renewals of any ties. Table II shows the total percentage of all failures in the original ties to date each year. Table III shows the percentage of renewals each year in order to maintain a property at a given standard—that is, it includes the renewals of renewed ties. Table IV shows the total percentage of all renewals to date to maintain a property. In all cases all percentages are percentages of the number of ties originally installed.

Years Installed	AVERAGE LENGTH OF LIFE IN YEARS																	Years Installed
	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	
1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.
2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.
3.	0.9	0.7	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.
4.	1.9	1.7	1.5	1.2	0.9	0.7	0.7	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	4.
5.	9.4	5.2	2.9	2.0	1.7	1.5	1.3	0.8	0.7	0.7	0.7	0.6	0.5	0.4	0.2	0.2	0.1	5.
6.	23.1	16.5	11.9	7.9	4.9	2.9	1.6	1.5	1.6	1.3	1.2	0.9	0.7	0.6	0.7	0.6	0.6	6.
7.	26.3	25.7	21.5	15.1	13.3	10.0	7.0	4.6	2.1	1.9	1.3	1.1	1.2	1.2	1.0	0.8	0.6	7.
8.	22.9	22.9	23.3	25.1	19.8	17.1	13.5	11.0	9.0	6.1	4.4	2.9	2.0	1.2	1.1	1.0	1.1	8.
9.	10.0	18.3	20.1	19.9	20.8	20.5	18.4	16.7	14.0	11.4	9.1	7.5	5.4	4.2	2.7	2.0	1.2	9.
10.	3.0	4.3	11.5	17.1	17.9	17.7	19.1	18.7	16.8	15.9	14.0	11.0	9.8	8.1	6.4	5.1	4.1	10.
11.	1.4	2.0	3.0	6.3	12.5	16.0	16.2	15.9	17.1	17.1	15.4	15.0	13.7	11.4	10.0	8.4	6.7	11.
12.	0.6	1.2	1.5	2.1	3.7	7.2	13.2	14.8	14.9	14.2	15.4	16.1	14.8	13.5	13.2	11.6	9.7	12.
13.	0.3	0.8	1.0	1.3	1.8	2.9	4.0	8.2	12.6	13.7	13.6	13.1	13.5	15.0	13.6	12.3	12.9	13.
14.	0.2	0.5	0.7	0.8	1.0	1.4	2.0	3.0	4.9	9.0	12.2	12.6	12.3	12.2	12.7	13.9	12.8	14.
15.		0.2	0.4	0.5	0.7	0.9	1.1	1.4	2.2	3.2	5.8	10.2	11.5	11.7	11.6	11.6	11.8	15.
16.			0.2	0.3	0.5	0.5	0.8	1.0	1.1	1.8	2.5	3.0	7.0	9.9	10.9	10.8	11.1	16.
17.				0.2	0.3	0.3	0.5	0.8	0.9	1.1	1.2	1.5	2.8	4.1	7.2	9.7	10.1	17.
18.					0.1	0.2	0.3	0.5	0.7	0.8	0.9	1.2	1.3	2.2	2.9	4.8	8.1	18.
19.						0.1	0.2	0.3	0.5	0.6	0.7	1.0	0.8	1.1	1.7	2.4	2.6	19.
20.							0.1	0.2	0.3	0.4	0.5	0.7	0.7	0.7	1.0	1.2	1.7	20.
21.								0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.8	0.8	1.4	21.
22.									0.1	0.2	0.3	0.4	0.5	0.5	0.7	0.7	0.8	22.
23.										0.1	0.2	0.3	0.4	0.4	0.5	0.5	0.6	23.
24.											0.1	0.2	0.2	0.4	0.4	0.5	0.5	24.
25.												0.1	0.2	0.3	0.3	0.4	0.4	25.
26.													0.1	0.2	0.2	0.3	0.4	26.
27.														0.1	0.1	0.2	0.3	27.
28.															0.1	0.1	0.2	28.
29.																0.1	0.1	29.
30.																	0.1	30.

Table I.—Percentage (of All Ties Installed) of Failures to Be Expected Each Year from Ties Having Various Assumed Average Lengths of Life, and No Renewals Being Made

Years Installed	AVERAGE LENGTH OF LIFE IN YEARS																	Years Installed
	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	
1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.
2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.
3.	0.9	0.7	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.
4.	2.8	2.4	2.0	1.4	1.0	0.8	0.7	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	4.
5.	12.2	7.6	4.9	3.4	2.7	2.3	2.0	1.3	1.0	0.9	0.8	0.7	0.5	0.4	0.2	0.2	0.1	5.
6.	35.3	24.1	16.8	11.3	7.6	5.2	3.6	2.8	2.6	2.2	2.0	1.6	1.2	1.0	0.9	0.8	0.7	6.
7.	61.6	49.8	38.3	26.4	20.9	15.2	10.6	7.4	4.7	4.1	3.3	2.7	2.4	2.2	1.9	1.6	1.3	7.
8.	84.5	72.7	61.6	51.5	40.7	32.3	24.1	18.4	13.7	10.2	7.7	5.6	4.4	3.4	3.0	2.6	2.4	8.
9.	94.5	91.0	81.7	71.4	61.5	52.8	42.5	35.1	27.7	21.6	16.8	13.1	9.8	7.6	5.7	4.6	3.6	9.
10.	97.5	95.3	93.2	88.5	79.4	70.5	61.6	53.8	44.5	37.5	30.8	24.1	19.6	15.7	12.1	9.7	7.7	10.
11.	98.9	97.3	96.2	94.8	91.9	86.5	77.8	69.7	61.6	54.6	46.2	39.1	33.3	27.1	22.1	18.1	14.4	11.
12.	99.5	98.5	97.7	96.9	95.6	93.7	91.0	84.5	76.5	68.8	61.6	55.2	48.1	40.6	35.3	29.7	24.1	12.
13.	99.8	99.3	98.7	98.2	97.4	96.6	95.0	92.7	89.1	82.5	75.2	68.3	61.6	55.6	48.9	42.0	37.0	13.
14.	100.0	99.8	99.4	99.0	98.4	98.0	97.0	95.7	94.0	91.5	87.4	80.9	73.9	67.8	61.6	55.9	49.8	14.
15.		100.0	99.8	99.5	99.1	98.9	98.1	97.1	96.2	94.7	93.2	91.1	85.4	79.5	73.2	67.5	61.6	15.
16.			100.0	99.8	99.6	99.4	98.9	98.1	97.3	96.5	95.7	94.1	92.4	89.4	84.1	78.3	72.7	16.
17.				100.0	99.9	99.7	99.4	98.9	98.2	97.6	96.9	95.6	96.2	93.5	91.3	88.0	82.8	17.
18.					100.0	99.9	99.7	99.4	98.9	98.4	97.8	96.8	96.5	95.7	94.2	92.8	90.9	18.
19.						100.0	99.9	99.7	99.4	99.0	98.5	97.8	97.3	96.8	95.9	95.2	93.5	19.
20.							100.0	99.9	99.7	99.4	99.0	98.5	98.0	97.5	96.9	96.4	95.2	20.
21.								100.0	99.9	99.7	99.4	99.0	98.6	98.1	97.7	97.2	96.6	21.
22.									100.0	99.9	99.7	99.4	99.1	98.6	98.4	97.9	97.4	22.
23.										100.0	99.9	99.7	99.5	99.0	98.9	98.4	98.0	23.
24.											100.0	99.9	99.7	99.4	99.3	98.9	98.5	24.
25.												100.0	99.9	99.7	99.6	99.3	98.9	25.
26.													100.0	99.9	99.8	99.6	99.3	26.
27.														100.0	99.9	99.8	99.6	27.
28.															100.0	99.9	99.8	28.
29.																100.0	99.9	29.
30.																	100.0	30.

Table II.—Cumulative Percentage (of All Ties Installed) to Date, of Failures to Be Expected Each Year from Ties Having Various Assumed Average Lengths of Life, and No Renewals Being Made

These tables are based on the actual record of removals instead of on the theoretical curve, except that 100 per cent instead of 99.9 per cent has been taken as removed at 200 per cent of the average life, and some slight adjustments have been made to avoid self-evident inconsistencies. If these tables were platted, therefore, the curves would not be perfectly true curves, but their irregularities would be of slight moment. It is probable that additional data secured hereafter will not make any radical changes in the tables, this being especially true of Tables II and IV, covering total renewals to date.

Plates 1 and 2 are the graphical representations of Tables III and IV, respectively. A study of Plate 1 (showing the percentage of tie renewals each year) indicates that the irregularities or inconsistencies in the basic data will gradually become "ironed out" as the age of the road increases, so that

Years Installed	AVERAGE LIFE IN YEARS																	Years Installed
	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	
1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.
2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.
3.	0.9	0.7	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.
4.	1.9	1.7	1.5	1.2	0.9	0.7	0.7	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	4.
5.	9.4	5.2	2.9	2.0	1.7	1.5	1.3	0.8	0.7	0.7	0.7	0.6	0.5	0.4	0.2	0.2	0.1	5.
6.	23.11	16.50	11.9	7.90	4.90	2.90	1.6	1.5	1.6	1.3	1.2	0.9	0.7	0.6	0.7	0.6	0.6	6.
7.	26.33	25.72	21.52	15.10	13.30	10.00	7.0	4.6	2.1	1.9	1.3	1.1	1.2	1.2	1.0	0.8	0.6	7.
8.	23.11	23.00	23.55	25.12	19.81	17.11	13.5	11.00	9.00	6.10	4.40	2.90	2.0	1.2	1.1	1.0	1.1	8.
9.	10.77	18.71	20.31	19.98	20.84	20.53	18.42	16.71	14.00	11.40	9.10	7.50	5.4	4.2	2.7	2.0	1.2	9.
10.	5.00	5.49	12.16	17.38	18.04	17.78	19.13	18.72	16.81	15.91	14.01	11.01	9.80	8.10	6.40	5.10	4.1	10.
11.	6.16	4.91	4.45	7.08	12.95	16.26	16.34	15.97	17.14	17.13	15.42	15.01	13.71	11.40	10.00	8.40	6.7	11.
12.	11.71	6.64	5.06	4.01	4.84	7.86	13.60	15.01	15.01	14.27	15.44	16.13	14.82	13.51	13.21	11.61	9.7	12.
13.	18.04	12.37	8.20	5.24	4.19	4.32	4.83	8.68	12.88	13.88	13.71	13.17	13.53	15.02	13.62	12.31	12.9	13.
14.	19.92	16.67	12.44	8.29	4.77	4.29	3.67	4.00	5.53	9.42	12.48	12.78	12.40	12.26	12.74	13.93	12.82	14.
15.	18.32	18.79	16.05	12.10	8.86	6.28	4.30	3.37	3.36	4.04	6.36	10.56	11.72	11.84	11.69	11.66	11.84	15.
16.	13.71	16.68	17.49	15.70	12.24	9.15	6.42	4.71	3.37	3.33	3.51	3.66	7.44	10.20	11.10	10.94	11.19	16.
17.	10.32	13.10	15.79	16.70	14.78	12.08	9.05	7.00	4.96	3.61	2.98	2.67	3.59	4.64	7.58	9.97	10.28	17.
18.	10.02	9.85	12.36	15.40	15.52	14.30	11.70	9.49	7.11	5.28	3.95	3.20	2.66	3.13	3.55	5.26	8.43	18.
19.	12.89	8.81	8.89	12.04	14.15	14.76	13.77	11.77	9.41	7.36	5.52	4.28	3.07	2.70	2.77	3.16	3.14	19.
20.	15.28	10.69	8.60	7.62	11.58	13.41	14.20	15.25	11.36	9.39	7.37	5.74	4.35	3.24	2.74	2.44	2.57	20.
21.	16.79	13.48	9.92	6.10	9.12	11.07	12.99	13.38	12.79	11.16	9.24	7.49	5.96	4.46	3.55	2.77	2.78	21.
22.	16.17	15.35	12.14	8.61	7.80	9.03	10.87	12.12	12.82	13.18	10.83	9.21	7.65	5.98	4.82	3.72	2.93	22.
23.	14.27	15.35	13.98	10.79	8.03	7.76	8.81	10.12	11.64	12.12	11.73	10.71	9.13	7.54	5.16	4.81	3.80	23.
24.	12.56	14.14	14.52	12.85	9.39	7.65	7.22	8.34	9.88	11.06	11.68	11.41	10.18	9.11	7.57	6.24	4.98	24.
25.	12.12	12.32	13.88	14.12	10.67	8.99	7.06	7.15	8.13	9.41	10.65	11.19	10.87	10.10	8.79	7.53	6.25	25.
26.	12.98	11.22	12.37	13.95	12.49	10.53	8.03	6.91	6.93	7.69	9.23	10.28	10.72	10.49	9.70	8.67	7.57	26.
27.	14.35	11.33	11.19	12.64	12.69	11.82	9.36	7.63	6.47	6.75	7.78	8.83	9.82	10.32	10.09	9.47	8.54	27.
28.	15.20	12.38	10.51	10.98	12.41	12.42	10.85	8.89	6.91	6.37	6.70	7.35	8.56	9.51	9.93	9.80	9.26	28.
29.	15.10	13.57	10.99	9.95	11.30	12.22	11.73	10.17	7.64	6.68	6.10	6.42	7.37	8.38	9.10	9.61	9.48	29.
30.	14.30	14.16	12.02	9.78	10.17	11.40	11.92	11.05	9.26	7.67	6.01	5.86	6.37	7.13	8.00	8.83	9.30	30.

Table III.—Total Percentage (of All Ties Originally Installed) of Tie Renewals to Be Expected Each Year in Order to Maintain a Property (Including Renewal of Renewed Ties) with Various Assumed Average Lengths of Life of Ties

Years Installed	AVERAGE LIFE IN YEARS																	Years Installed
	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	
1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.
2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.
3.	0.9	0.7	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.
4.	2.8	2.4	2.0	1.4	1.0	0.8	0.7	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	4.
5.	12.2	7.6	4.9	3.4	2.7	2.3	2.0	1.3	1.0	0.9	0.8	0.7	0.5	0.4	0.2	0.2	0.1	5.
6.	35.3	24.1	16.8	11.3	7.6	5.2	3.6	2.8	2.6	2.2	2.0	1.6	1.2	1.0	0.9	0.8	0.7	6.
7.	61.6	49.8	38.3	26.4	20.9	15.2	10.6	7.4	4.7	4.1	3.3	2.7	2.4	2.2	1.9	1.6	1.3	7.
8.	84.7	72.8	61.7	51.5	40.7	32.3	24.1	18.4	13.7	10.2	7.7	5.6	4.4	3.4	3.0	2.6	2.4	8.
9.	95.5	91.5	82.0	71.5	61.5	52.8	42.5	35.1	27.7	21.6	16.8	13.1	9.8	7.6	5.7	4.6	3.6	9.
10.	100.5	97.0	94.1	88.9	79.6	70.6	61.6	53.8	44.5	37.5	30.8	24.1	19.6	15.7	12.1	9.7	7.7	10.
11.	106.7	101.9	98.6	96.0	92.5	86.9	78.0	69.8	61.6	54.6	46.2	39.1	33.3	27.1	22.1	18.1	14.4	11.
12.	118.4	108.6	103.6	100.0	97.4	94.7	91.6	84.8	76.7	68.9	61.7	55.2	48.1	40.6	35.3	29.7	24.1	12.
13.	136.4	120.9	111.8	105.2	101.6	99.1	96.4	93.5	89.5	82.8	75.4	68.4	61.7	55.6	48.9	42.0	37.0	13.
14.	156.3	137.6	124.3	113.5	106.3	103.3	100.1	97.5	95.1	92.2	87.9	81.2	74.1	67.9	61.7	55.9	49.8	14.
15.	174.7	156.4	140.3	125.6	115.2	109.6	104.4	100.9	98.4	96.2	94.2	91.8	85.8	79.7	73.4	67.6	61.7	15.
16.	188.4	173.1	157.8	141.3	127.4	118.8	110.8	105.6	101.8	99.6	97.7	95.4	93.2	89.9	84.5	78.5	72.8	16.
17.	198.7	186.2	173.6	158.0	142.2	130.9	119.9	112.6	106.8	103.4	100.7	98.1	96.8	94.6	92.0	86.5	83.1	17.
18.	208.7	196.0	186.0	176.4	157.7	145.2	131.6	122.1	113.9	108.7	104.7	101.3	99.5	97.7	95.6	93.8	91.6	18.
19.	221.1	204.8	194.9	185.4	171.9	159.9	145.3	133.8	123.3	116.0	110.2	105.6	102.5	100.4	98.4	96.9	94.7	19.
20.	236.4	215.7	203.5	193.1	183.5	173.3	159.5	147.1	134.6	125.4	117.5	111.3	106.9	103.6	101.1	99.4	97.3	20.
21.	253.2	229.2	213.4	201.2	192.6	184.4	172.5	160.5	147.4	136.6	126.8	118.8	112.8	108.1	104.6	102.1	100.0	21.
22.	269.3	244.6	225.5	210.0	200.4	193.4	183.4	172.6	160.2	148.8	137.6	128.0	120.5	114.1	109.5	105.9	103.0	22.
23.	283.6	259.9	239.5	220.8	208.4	201.2	192.2	182.7	171.9	160.9	149.3	138.7	129.6	121.6	114.6	110.7	106.8	23.
24.	296.2	274.0	254.0	233.6	217.8	209.0	199.4	191.0	181.8	171.9	161.0	150.1	139.8	130.7	122.2	116.9	111.8	24.
25.	308.3	286.4	267.9	247.7	228.5	218.0	206.5	198.2	189.9	181.3	171.7	161.3	150.7	140.8	131.0	124.4	118.0	25.
26.	321.3	297.6	280.3	261.7	241.0	228.6	214.5	205.1	196.8	189.2	180.9	171.6	161.4	151.3	140.7	133.1	125.6	26.
27.	335.6	308.9	291.5	274.3	253.9	240.4	223.9	212.7	203.3	196.0	188.7	180.4	171.2	161.6	150.8	142.6	134.1	27.
28.	350.8	321.3	302.0	285.3	266.3	252.8	234.7	221.6	210.2	202.4	195.4	187.8	179.8	171.1	160.7	152.4	143.4	28.
29.	365.9	334.9	313.0	295.2	277.6	265.0	246.5	231.8	218.0	209.0	201.5	194.2	187.1	179.5	169.8	162.0	152.9	29.
30.	380.2	349.0	325.0	306.0	287.8	276.4	258.4	242.8	227.3	216.7	206.5	200.1	193.5	186.7	177.8	170.8	162.2	30.

Table IV.—Cumulative Percentage (of All Ties Originally Installed) to Date, of Tie Renewals to Be Expected Each Year in Order to Maintain a Property (Including Renewal of Renewed Ties) with Various Assumed Average Lengths of Life of Ties

the renewal curves become more regular, while it will be seen from Plate 2 that the slight irregularities in the curves showing the total renewals to date are practically insignificant from the start. Even in Plate 1 there should be little difficulty in determining which curve most nearly fits renewals which have actually been made on a railroad. When sufficient additional basic data have been secured the results can be tabulated and platted into consistently smooth curves which will show the true average rates of failures, to the same extent as has been the case in preparing mortality tables for insurance purposes.

If complete records of tie renewals on a railroad are available from the time of original construction, the total to date renewals each year in terms of the percentage of all ties in track (assuming the entire original installation to have been made in one year) can be platted and the average life of the ties can be closely approximated at once by finding which curve on Plate 2 most nearly corresponds with the result. Even the determination of only one point on the curve (the percentage to date for the last year for which records are available) might give reliable results, but it would be best to plat the complete curve to make sure that there has been no change in the average life of the ties during the life of the railroad. If the renewals for the first few years are not available, the renewals for each year available can be platted in terms of the percentage of all ties installed, and by comparison with Plate 1 (bearing in mind the relation between the time of original installation and the time covered by the available records) the average life obtained can be closely approximated. While there are two checks on this method, provided there has been no change in the average life (one being the actual percentages and the other the direction or course of the curve at that stage of the life of the road) the method of using Plate 2 will be more reliable, and should be used wherever practicable.

It should always be borne in mind, in order that comparisons of the kind mentioned above may be dependable in their results, that the investigation should cover a large number of ties; if only a small number of ties is involved the irregularities in the lines of individual ties may cause incorrect conclusions or obscure results. Also a change in the kind of ties used, or a change in the standard of maintenance will have its effect on renewals. Without realizing the natural cause which makes necessary a material variation in the annual renewals during each cycle of the average life of ties, there is a natural tendency on the part of a railroad management towards uniform annual renewals before the road is old enough to have reached that stage itself; furthermore the financial situation of the road may cause unusual retrenchments at times. These causes will affect the renewal curves, so that they will not fit the theoretical curves as closely as desirable. All these objections, however, pertain to any method whatever of determining the average life, and due allowance must be made for them in the best manner possible. The situation can be better studied and understood by graphical representation than otherwise.

There will be many cases where this method of determination can be used to advantage on small roads or on the different portions of a large system, or it can be applied to a system as a whole by combining the results obtained by working up separately the renewals of ties for each year's original installation. Tables III and IV and Plates 1 and 2 should also be extended through a greater number of years, and it might be possible to develop a practicable means of recognizing in renewal curves a change in average life due to a change in standard of maintenance or change in kind of ties. Any change in average life would be noticeable in the platting and if a ready means of recognizing the full meaning of the change could be developed, it would be of value.

It is not claimed that this method will wholly solve the question of average life, for there will be cases where lack of records, changes in the cross tie situation, and other difficulties will make a very close approximation impossible. However, the basic data are such that the tables and plates presented in this discussion closely represent the true average conditions, and much closer approximations to the actual average life can be made in this way, where this method can be applied, than in any other manner.

A method which has been used to some extent heretofore is to consider that the number of years after the construction of a line, until the total to date of renewals is the same as the total number of ties originally installed, represents the average life of the ties. By reference to Table IV it will be found

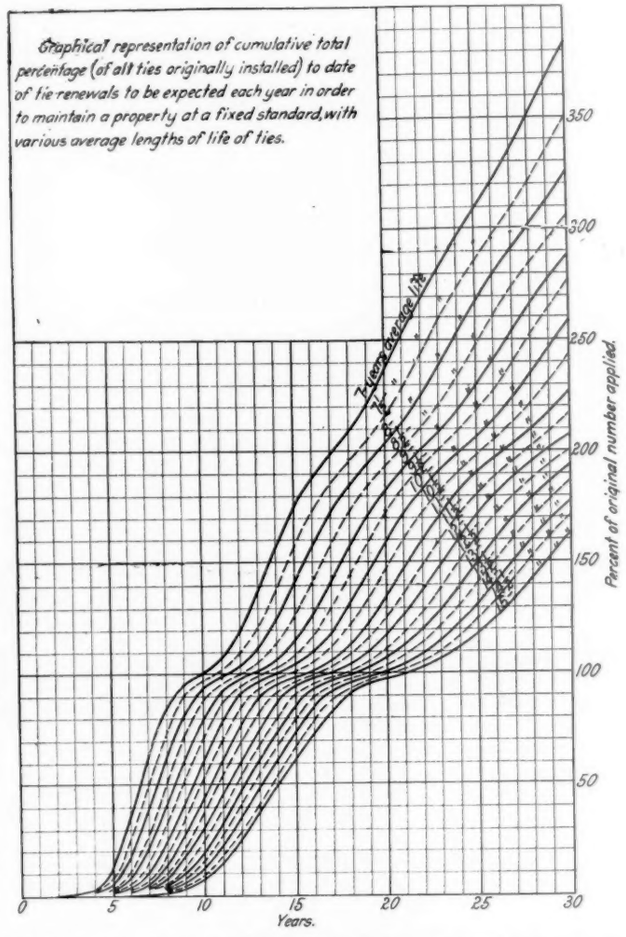


Plate 2. A Chart of Cumulative Renewals in Per Cents of Ties Originally Installed

that this is incorrect according to the best information now available, as a total of 100 per cent renewals is not obtained for from three (for 7-year ties) to six years (for 15-year ties) after the road has been constructed for that length of time. At the age of the average life of the ties, only slightly more than 60 per cent of the ties have been removed.

The use of the data submitted by Miss Thorne for the purpose covered by this discussion involves a large amount of calculation. Tables I to IV place her data in convenient form for ready use for that purpose, as well as for other purposes. By the use of these data it will no doubt be found that the average life of ties can be determined with reasonable accuracy in many cases where it has seemed impracticable to obtain any reliable result by other methods.

The preceding discussion has dealt mainly with roads, or portions of roads, which are comparatively young. If a road is, say, 50 years old, it would hardly be of much value to

plat the renewals to date from the time of construction, for such a road would surely have had many changes in its mileage during its life, as well as changes in its kinds of ties, standards of maintenance, etc. In such cases the usual method of averaging renewals over a considerable period of years is necessary, but if the renewals have been made just as physically needed, the platting of the renewals will give a wavy line, with the length of the waves just equal to the average life of the ties. This wave length will afford a check on the result obtained by averaging the renewals. If the waves vary much above and below the average line, the number of years averaged should be some multiple of the average life determined by measuring the wave length, so that the average may not include too many of the years either above or below the line.

It is probable that the platting of the renewals may not, in many cases, show any reasonably pronounced wave lengths in practicable application, but bearing this feature in mind may, in some cases, be an aid in indicating the probable reliability of the conclusions. The failure to show waves, assuming a constant mileage, would indicate either that the age of the road is such that renewal requirements have become practically uniform (which, under normal conditions, would be at an age of some 40 years for 7-year ties, some 65 years for 9-year ties, etc.—see articles by S. S. Roberts and Lowry Smith in the Railway Maintenance Engineer for June, 1920) or some change in the average life, or that, from some cause or other, tie replacements have been forced towards uniform renewals without full regard to the actual physical requirements.

It is to be hoped that the railroads will secure additional data as may be practicable, covering the relation between average life and percentage of renewals, and see that all are collected at some one source, so that information on that subject may in time reach the same degree of reliability as do mortality tables. The renewal of ties constitutes a very large item in maintenance expenses, and would justify a more thorough scientific investigation than has frequently been customary heretofore. In many cases such a consideration of the subject might far more than pay for itself by affording the most intelligent method possible for regulating tie renewals from year to year.

Four Objections to Installing Automatic Stops

Abstract of Memorandum Presented at Washington, March 20, by A. R. A. Committee, C. E. Denney, Chairman

THE COMMITTEE appointed by the railroads affected by the Interstate Commerce Commission's order of January 10, 1922, calling for the installation of automatic train control devices, presented a memorandum at the hearing before the Commission in Washington on Monday last, rehearsing the objections to the issuance of a positive order by the Commission at the present time and classifying them under four heads, as set forth below; and also presented other statements, prepared by Messrs. Burt and Peabody, containing the results of investigations made by the committee. This committee consists of C. E. Denney, B. R. Pollock, A. M. Burt, W. P. Wiltsee, E. B. Katte, R. W. Bell, C. F. Giles, W. J. Eck and C. H. Morrison.

This abstract is in the nature of a supplement to our report of the Washington hearing, which is printed elsewhere, and some details of the memorandum which have already been covered in the larger report are omitted here.

1. No automatic train stop or train control device has been sufficiently developed to justify the issuance of the proposed order. That the state of the art as it existed up to the beginning of the year 1920 did not warrant any extended use of the devices in question is, we submit, not open to debate. The Committee of the United States Railroad Administration (1919) summarized the situation thus:

"Generally speaking, it may be said that the tests which have thus far been conducted have demonstrated that the functions of automatic train control devices are possible of accomplishment under actual service conditions. But while these functions may be accomplished at comparatively isolated locations with the high degree of maintenance ordinarily given to test installations of this character, it is an entirely different problem, and a far more complex one, to apply these devices to the various operating conditions encountered in railroad service * * * on several hundred miles of a busy railroad. * * * Automatic train control devices are still in the development stage, and many problems in connection with their practical application remain to be solved."

These views are consonant with those of the Block Signal and Train Control Board (June 29, 1912), also with the reports of the Commission's Bureau of Safety. While progress has been made during the past two years, it is still true that *many problems in connection with practical operation remain to be solved.*

The only systems which have been in service under actual operating conditions and dependable and continuous observation for any considerable length of time, are those of the Regan, the Miller and the American, now in service to a limited extent on the Rock Island, the C. & E. I., and the C. & O. These three are the only installations of which specific mention is made in the Commission's report of January 10, 1922, which, we submit, warrants the inference that the Commission had them in mind when it said that "14 years of investigation have demonstrated the practicability of and the necessity for automatic train control." In any event, the failure of the Commission, in its report, to direct attention to any other particular installation, must lead to the conclusion that in the judgment of the Commission no other system of train stop or train control has been sufficiently tried out to warrant even the suggestion that it be generally adopted.

The three installations above referred to have been the subject of special investigations conducted by a subcommittee of the Joint Committee on Automatic Train Control of the American Railway Association. The report of such committee shows, among other things, with respect to each of the devices in question:

(*a*) Numerous objectionable mechanical and engineering features remaining to be corrected;

(*b*) Many operating difficulties which have not yet been satisfactorily taken care of;

(*c*) A relatively large number of failures.

In short, this report conclusively establishes not only that the devices in question have not yet been brought up to the point where it can be said that they show a "high degree of efficiency" under general service conditions, but also that they, like all other kindred devices, are still in the experimental or development stage and that many problems remain to be solved before they can be considered as practicable and reliable for the purposes of the Commission's proposed order.

We are dealing with a very different proposition from that of the automatic coupler, the air brake or the block signal.

The Commission's observation to the effect that the automatic coupler, the air brake and the automatic block signal were not perfected to as high a degree as the automatic train control before they were either ordered installed or were voluntarily adopted, appears to be at variance with the facts.

The records of the Master Car Builders' Association show that the automatic freight car coupler was a subject of discussion and experimentation from 1870 to 1887, a period of 17 years, before it was adopted by the association as recommended practice. It was six years later than this before its use was required by law. Prior to its requirement by law it was a well recognized safety device.

The air brake was a subject of discussion and experimentation from 1870 to 1888, a period of 18 years, before it was adopted as recommended practice, and it was 23 years before it was required

by law; then it was a safety device recognized by all of the more progressive railroads of the country.

Automatic block signals had reached a much higher degree of development than train control devices have at present before any such extensive installations were made as is contemplated in the proposed order, and the installation of automatic block systems was a much simpler matter than the installation of automatic train control devices. With an automatic train control system no engines can be operated under it except those equipped with a device that will function in conjunction with the system installed upon the roadway. The adoption of the automatic coupler and air brake did not affect the capacity of a railroad; their practicability had been demonstrated beyond a reasonable doubt before their use was required by law.

2. The order would be premature if issued at this time because the carriers have not had opportunity to make adequate service tests of devices designed to function on different principles from the devices specifically mentioned in the Commission's report. Each of the three systems specifically mentioned in the Commission's report is so designed as to require the use of a ramp located alongside or between the rails.

Efforts are now being made to develop automatic train control devices designed to function on the induction principle, and it is the opinion of the engineering and operating officers of numerous carriers that such type gives promise of overcoming many of the objectionable features inherent in the ramp type. Train control systems designed to operate on the induction principle have lately been installed or are contemplated in the immediate future, viz.: the Sprague, the Bostwick and the Union Switch & Signal devices. These appear to possess merit and the result of the tests may warrant their extension. No order, therefore, should be issued until such time as the carriers have had ample opportunity to ascertain whether or not some one or more of such systems is practicable and reliable for the purposes of the Commission's order.

3. The carriers are making every reasonable effort to co-operate with the Commission in testing all meritorious devices and will continue such efforts as the Commission may direct.

In view of the activities of this committee since its appointment in November, 1920, as disclosed by this report, it would appear that the issuance of the proposed order, which cannot now be complied with, will tend to retard rather than promote the development of a proper system. The committee as well as the individual carriers will continue to render all reasonable assistance in the proper testing and development of these devices.

4. The proposed order requires a much greater number of and more extensive installations than are warranted at the present time.

Answers by all carriers named in the order of January 10 except the Pennsylvania, the Pittsburgh, Cincinnati, Chicago & St. Louis and the West Jersey & Seashore companies, to a questionnaire submitted by this committee, indicate that compliance with the proposed order by the carriers answering the questionnaire (46 in number) will require the installation of the devices in question on approximately 6,126 miles of railroad, 10,285 miles of track and 5,525 locomotives, the cost of which will aggregate many millions.

It is manifest that such systems as recommend themselves to the Commission can be just as thoroughly tried out by continued co-operation between the Commission and the American Railway Association along the lines heretofore followed, as can be done by the extensive installations contemplated by the proposed order, which would require the expenditure of vast sums of money unnecessarily.

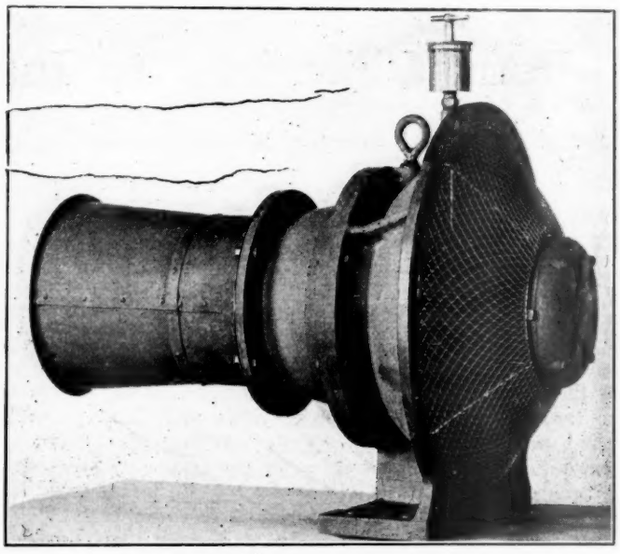
Photo by International

Russians Crowding Trains to American Relief Food Stations

Increased Efficiency in Propeller Blower

AN INTERESTING TYPE of propeller blower manufactured by the Coppus Engineering & Equipment Co., Worcester, Mass., is a screw blade unit which delivers air at higher pressures than usual and with good efficiency. The blowers are of the class which delivers the air parallel to the axis and operates against pressures up to 8 in. of water at efficiencies up to 80 per cent. Another factor of interest is that the power consumption at constant speed is practically unaffected by variations in air delivery or pressure. The blowers are high-speed machines requiring comparatively small driving units.

The principal feature of the blower is a stationary guide vane located beyond the propeller in the direction of the flow. The air current leaving the propeller is radially subdivided by the individual guide vane blades which have a curvature, increasing in the direction of the propeller. These guide vane blades concentrate the air current and give it a further acceleration inside of the stationary guide vane so that a considerable part of the pressure is produced in the latter. A large part of the end thrust is thus taken up by the stationary guide vane casing. The air streams, into which the flow of air has been subdivided, leave the guide vane casing, on account of the kinetic energy, slightly rotating and converging toward the axis so that the smallest section of the air flow is reached beyond the guide vane casing.



The New Coppus Propeller Blower

The blowers are of such a design that they can be installed readily in pipe lines, working at the same efficiency when installed at the inlet or outlet of the line as a blower or an exhauster, respectively.

OVERLOADED AUTOMOBILES are very common on the highways, according to reports from the inspectors of the Department of Agriculture. On the road from Hartford, Conn., to Springfield, Mass., and on the Boston Post road in Connecticut every third truck was found to be loaded beyond the capacity of the truck and the tires, according to a record covering two weeks of investigation on each roadway. Overloading was most common on trucks of 3 to 5 tons capacity. It was found that 89 per cent of the trucks on regular trucking lines had a total weight of truck and load in excess of 12½ tons, the maximum weight allowed by State law.

Burlington Offices at Chicago Suffer Fire Damage

Contents of Seven Floors Destroyed But Structural Steel Frame Escapes Serious Injury

As noted briefly in the *Daily Railway Age* of March 16, the 15-story office building of the Chicago, Burlington & Quincy at Clinton street and Jackson boulevard, Chicago, was visited by a disastrous fire early on the morning of March 15. The contents of the upper seven floors of the building were entirely destroyed and considerable damage was done on the lower floors by water. Owing to the fact that this is a modern fireproof building, completed in 1912, the cause of the fire, the extent of the damage and

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The Burlington Office Building After the Fire

the effects, if any, on the building frame, are of interest to engineers and architects. The following facts are based on a preliminary inspection in advance of a detailed study and report by officers of the railroad and the Chicago building department.

The fire was of outside origin. It started in one of a group of buildings occupying the block immediately east of the Burlington offices. These were a miscellaneous block of old buildings of varied types of construction, although all of them proved to be of a highly combustible nature. One of them was an eight-story building covering a considerable ground area. The initial blaze spread rapidly to the entire block and, owing to the height of some of these buildings, produced a fire of unusual intensity. The wind was blowing toward the west and southwest and soon caused fires in a number of buildings in adjacent blocks and for a time there was great danger of a general conflagration.

The Burlington building was almost directly in the path of the great flame blast from this seething furnace of burning buildings, being separated from them only by the width of Clinton street, 80 ft. The building is equipped with standpipes having four hose outlets on each floor and supplied with water by independent fire pumps in the basement of the building which draw water from the city supply. As soon as it was seen that the railroad office building was in danger, First Assistant Fire Marshal E. J. Buckley sent his men into the building and did everything possible to keep the fire out, but the heat was so intense on the upper floors that the men were compelled to retreat and from the ninth to the fifteenth floors, inclusive, the fire practically destroyed the combustible contents. This included all papers and records except such as were stored in fireproof vaults. Below the ninth floor the loss was limited entirely to water damage.

A preliminary investigation of the building would indicate that the steel frame is entirely uninjured. The fireproofing on the interior consists of hollow tile including flat tile arches for the floors. Barring the flaking off of practically all of the plaster and some minor spalling the tile appears to be in excellent condition. The exterior of the building on the street fronts is faced with a cream colored glazed terra cotta and on the Clinton street side, which faced the great fire and flying embers, the terra cotta has spalled to a considerable extent, especially around the window openings, but this spalling has not served to uncover the steel work at any point. The window construction in the Burlington building comprises wire glass in hollow metal frames in the court and alley frontage, but with plate glass and wood frames on the

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The Lower Floors Were Not Damaged by Fire But Were Bombarded by Flying Missiles from the Fire Across the Street

street frontage except opposite fire escapes, this being strictly in accordance with the building ordinance requirements of the city. The fire passed over the building from the east to the west and destroyed a large part of the windows. A few of the wire glass windows on the rear of the building are intact but in many cases the window construction is entirely gone.

Fortunately for the records, nearly all of the accounting

offices were located below the ninth floor. These included the offices of the auditors of expenditure and of freight and ticket accounts, the car accountant and the freight claim and employment departments. The portion of the building swept by the fire housed the executive offices; the operating, traffic, purchasing, transportation, engineering, real estate and land, industrial, and valuation departments; and the offices and record files of the Central Western region, United States Railroad Administration. In these offices the loss included practically all current correspondence files of the various departments, the records of the United States Railroad Administration, the valuation files and records, the drawings of the building department, and the tariff files. Although the vaults on the seven upper floors had not all been opened at the time of writing, there is every reason to believe that all of their contents were saved. These include such records as the bridge engineer's drawings, track standards, maps, and real estate records.

The value of enclosed elevator shafts and stairways is emphatically demonstrated in the building. These were not injured in any way other than the warping of some of the elevator doors and the melting of some of the wire glass.

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View of the Upper Seven Floors from the Court

The evidence is conclusive that the fire was not communicated from floor to floor in this building. In other words, there was an independent fire on each of the seven floors, communicated from the outside. The most positive evidence of this fact is to be found in the attic above the fifteenth floor. This attic space has no window exposure other than skylights and suffered in no way from the fire. Elevator machinery, blue print apparatus and storage files in this attic are entirely uninjured and the elevators were restored to operation very shortly after the fire.

ACCORDING to the Canadian Engineer, Toronto, water power developed and utilized in Canada in 1920 averaged 280 hp. per 1,000 of population whereas in the United States only 93 hp. had been developed per 1,000 inhabitants.

THE SOUTHERN PACIFIC, to cope with the flagrant carelessness of motorists who run into crossing gates, or into the sides of trains, has adopted the policy of seeking damages from the owners of such machines. During 1921, on the Pacific System, 186 automobiles were driven into the sides of trains; 85 crossing gates were broken down, often resulting in injuries to crossing flagmen; and 46 cars skidded into the sides of trains.

Increased Divisions Ordered for Missouri & North Arkansas

WASHINGTON, D. C.

AS A FURTHER STEP to enable the Missouri & North Arkansas to resume and continue operation, the Interstate Commerce Commission has issued an order providing that, effective as of March 1, the divisions of joint interstate rates received by its connecting lines on freight traffic interchanged with the Missouri & North Arkansas shall be reduced by from 10 to 25 per cent of the divisions in effect on January 1, the difference to accrue to the M. & N. A. in addition to the divisions it has received. Divisions on traffic as to which the M. & N. A. is an intermediate carrier are not, however, to be affected.

Although certain of its connecting lines had suggested that the southern portion of the line be abandoned, the commission holds that the road is a public necessity in its entirety and that its operation should be resumed and continued. To this end the commission on January 16 had approved an increase in its freight rates, estimated to amount to approximately $208,000 a year, and the Railroad Labor Board had authorized a 25 per cent reduction in the wages of its employees, estimated at $310,000, on condition that the owners of the property should receive no return on their investment until wages are returned to the standard scale. The road runs from Joplin, Mo., to Helena, Ark., 359 miles, and has branches making its total mileage 364.5 miles. Its investment in road and equipment is stated as $18,160,186. The company was organized in 1906 and has never been profitable. It was placed in a receivership in 1912 and suspended operation last July. In the complaint filed against its connecting roads, the Atchison, Topeka & Santa Fe; Chicago, Rock Island & Pacific; Kansas City Southern; Missouri, Kansas & Texas; Missouri Pacific; St. Louis-San Francisco, and Yazoo & Mississippi Valley, it asked for an increase in its divisions of 25 per cent, stating that an increase in rates alone would not alter its situation. The road admitted that, judged by mileage alone, it has received its full measure of divisions, but it contended that under the standards prescribed by the present law its divisions are unreasonable and unjust because insufficient to pay operating expenses, taxes and a fair return on its investment.

As the result of a conference with the commission a committee of traffic managers of connecting lines was appointed to study the traffic situation. This committee considered three plans, the first of which contemplated a diversion of tonnage to the road, the second an increase of the divisions, and the third an increase in rates. The first plan was discarded because of the lack of sufficient tonnage unrouted by shippers which could be diverted. An increase in divisions was not recommended but the committee recommended an increase in rates, estimated to amount to $208,673, the entire amount to accrue to the M. & N. A., and a reduction in wages. On petition of the receivers the Labor Board agreed to a reduction on the condition named and the commission approved a rate increase substantially as recommended but on complaint it also took up consideration of the divisions.

The report, after a discussion of the intent of the new provisions relating to divisions inserted in the law by the transportation act, says that the general increase in rates authorized in Ex Parte 74 was intended to permit a return of six per cent within the rate districts, under normal traffic conditions, but that it appears that the M. & N. A. could not, if operated, derive a share of the revenues thus provided fairly proportioned to the amount and character of its service.

In its conclusion the commission says in its report that it has taken into consideration the relation between the earnings realized by the carriers involved and the earnings contemplated by section 15-a; also the value of the property of each carrier.

"Notwithstanding the fact," the commission says, "that the record raises a strong presumption that most of the respondent's connecting lines are not now earning a return as great as is contemplated by section 15-a, we believe we are not precluded from making such adjustment of divisions as we find just and reasonable. It is necessary that all essential transportation facilities of the country be kept in operation. It is clear that in order to resume and continue operation, the Missouri & North Arkansas must have additional revenues, and irrespective of its nature, it is entitled to divisions which are just, reasonable and equitable under the standards prescribed in paragraph 6 of Section 15 of the interstate commerce act. We are convinced that, having fair regard for the necessities of all the carriers and considering all proper circumstances of the traffic, the divisions of interstate rates now accorded the Missouri & North Arkansas by its connections are unjust, unreasonable and inequitable. . . . " Commissioner Daniels dissented.

In order that it may keep in touch with the situation and if necessary make further adjustments, the commission's order requires that the Missouri & North Arkansas and its connecting lines shall jointly report to the commission on or before May 15 the divisions established under the order, together with the number of tons and ton-miles of freight for the year ending December 31, 1917, and the revenues, to include all increases of rates effective since 1917, of each carrier as to traffic moving under interstate joint rates between each of the stations or groups of stations for which divisions are determined. They are also to report jointly thereafter the tons, ton-mile and revenues with respect to such traffic actually interchanged for the period from January 1 to June 30, 1922, and from July 1 to December 31, 1922.

In addition to this W. A. Colston, director of the Bureau of Finance of the commission, has written a letter to R. E. Cave and Festus J. Wade, president of the Mercantile Trust Company of St. Louis, by authority of Division 4 of the commission, stating that the commission will approve a loan of $3,500,000 recently applied for, to the Missouri & North Arkansas or its approved successor, of which $3,000,000 would be for the purpose of meeting maturing indebtedness reduced to a judgment in receivership proceedings and foreclosure suits in the United States district court for the eastern district of Arkansas, and $500,000 for additions and betterments, on certain conditions. The conditions are that there shall be such sale or other disposition of the property as will release it entirely from all existing claims and obligations so that the government loan may be secured by an absolute first lien on the property, and before the loan is made such proceedings shall be taken as may be necessary to cancel all stocks, bonds and other securities of the Missouri & North Arkansas or of others in any way resting on the property and the new property shall be covered by two issues of securities only: $5,000,000 of first mortgage bonds to be given as security for the government loan and $3,000,000 of stock to be turned over to such representative or committee as may be organized or authorized to receive same for those who will pay or secure the payment of $500,000 of additional working capital. It is to be understood that this working capital is in addition to any current assets which may be obtained in the purchase of the railway property, rights and franchises. Also conveyance will be made to the reorganized company or to the new company to be formed of all current assets and equipment, materials and supplies in addition to roadway and appurtenances. The committees, owners, or representatives of the property shall secure the undertaking of the Mercantile Trust Company of St. Louis to supervise the distribution of the proceeds of the loan and shall provide $60,000 to be used in connection with payments to secure competent supervision and operation.

Railroads' Arguments Against Automatic Stops

Carriers Claim Devices Are in Development Stage and That Proposed I. C. C. Order is Too Drastic

CLAIMING that no automatic train stop or train control device has been sufficiently developed to warrant installation on such an extensive scale as is outlined in the proposed order of the Interstate Commerce Commission and that the American Railway Association is diligently working for the development of a practical device which will meet the Commission's order and serve the purpose of the railroads, Alfred P. Thom, counsel for the Association of Railway Executives, speaking at the hearing in Washington on March 20, urged that the Commission refrain from issuing such an order. A committee of the American Railway Association, representing 40 of the 49 railroads included in the proposed order, presented supporting evidence. This evidence was presented by R. H. Aishton, president of the American Railway Association; C. E. Denney, vice-president and general manager of the New York, Chicago & St. Louis, and chairman of the railroads' committee; A. M. Burt, assistant to the vice-president of the Northern Pacific, and J. A. Peabody, signal engineer of the Chicago & North-Western. The hearing was held before Commissioners McChord, Esch and Lewis. After the carriers' committee had finished presenting its data the individual roads submitted additional statements as to why the order should not be entered against them, or should be modified.

Mr. Aishton outlined the formation of the joint committee and the co-operation of the American Railway Association with representatives of the Bureau of Safety of the Interstate Commerce Commission and said that in connection with the work the association in the last 15 months has spent $20,000. Mr. Aishton said that the carriers' committee does not represent the Chicago & Eastern Illinois, the Chicago, Rock Island & Pacific, the Long Island, the Norfolk & Western, the Pennsylvania, the Philadelphia & Reading, the Pittsburgh, Cincinnati, Chicago & St. Louis, the West Jersey & Seashore and the Chesapeake & Ohio. Continuing, he said:

"The following questions naturally presented themselves for answer:

"(1) Has automatic train control reached a point of development reasonably justifying an order requiring its extensive installation at this time? The committee's answer to this is, No. * * *

"(2) If installation for further tests is advisable, is duplication of tests necessary? The committee expresses the opinion that such duplication will not serve any practical purpose.

"(3) Are further developments probable; or other principles than those now being advocated and under development? The committee is of the opinion that induction methods of train control are being rapidly developed and that tests now being arranged for will give valuable information and promise progress.

"(4) Are the proposed requirements such as best cover

the situation? The committee will propose amendments.

"(5) The committee has not entered into the financial side of the question in any manner, but it is a serious question for this Commission whether automatic train control will provide greater additional safety for a given expense than the same expenditure will produce through the installation of automatic signals, extensions of double track, etc., * * * and other improvements which not only increase safety, but increase the capacity of the railroad and produce large economies in operation. It is an open question, whether any of the devices so far tested do not have a tendency to decrease the capacity of a railroad.

"The policy of the railroads is now, as it has been in the past, that within their financial ability they are continually seeking to find better methods for promoting safety as well as economy and the production of better service. Applications to the Commission for authority for financing disclose that a large part of the money for which authority is now asked is to be devoted to purchases which tend toward better operation, greater safety and better service. Under present financial conditions expenditures should be confined as largely as possible to known and demonstrated channels * * *."

Commissioner Esch then asked if, in the opinion of Mr. Aishton, carriers had properly co-operated in the development of automatic train control; the matter had been brought up over 14 years ago. Mr. Aishton replied that he could not say, except for the last 15 months, in which period he felt that progress had been made. Prior to that time and during the war and under Federal control little could be done except to keep trains moving. Commissioner Esch called attention to the final report of the Block Signal & Train Control Board, made in 1912, in which it was stated that ten or fifteen devices had sufficient merit to justify further test, and asked if since 1912, up to the war, whether the financial status of the railroads was such as to prevent them acting on development of such devices. Mr. Aishton, in reply, called attention to the fact that during that period legislation on electric headlights and steel cars was passed, which required large expenditures by the railroads, and that this may have diverted the railroads from the automatic train control question.

Brief Submitted by Mr. Denney

The brief of the carriers, submitted by Mr. Denney, will be found under another head. In connection with it he said that the American Railway Association was co-operating with the Interstate Commerce Commission. Two additional installations of train control apparatus have been arranged for, one on the Southern Pacific, and one on the New York Central; and he referred to the experimental installations of the General Railway Signal Company's device on the Buffalo, Rochester & Pittsburgh; the International Signal Company's device on the Erie, and the Shadle device on the Cincinnati, Indianapolis & Western. He also referred to the Union Switch & Signal Company's plan for making an installation on the Pennsylvania Railroad. Mr. Denney emphasized the fact that it has been and will be the aim of the American Railway Association to co-operate with the Commission.

Commissioner Esch asked as to the powers given the A. R. A. committee on automatic control to secure the co-operation of the railroads. Mr. Denney replied that the committee was not authorized to spend any money. As to whether automatic stops would increase the capacity of a railroad, Mr. Esch quoted a statement made in March, 1920, by J. M. Waldron, signal engineer of the Interboro Rapid Transit Company, New York, that automatic train control had increased the capacity of these lines 43 per cent. Mr. Denney replied that conditions on the Interboro were in no way comparable to those on steam operated railroads in the open. Mr. Esch asked about the A. R. A. inspections on the Chicago, Rock Island & Pacific, the Chicago & Eastern Illinois, and the Chesapeake & Ohio by the American Railway Association in February. Mr. Denney stated that the main purpose was to have these men watch operation during severe winter weather.

A. M. Burt's Report

Mr. Burt presented a report on the views of the railroads' committee with respect to differences between the specifications (a) as adopted by the committee of the American Railway Association and representatives of the Bureau of Safety of the Interstate Commerce Commission and (b) the specifications included in the Commission's proposed order. There is one difference which is felt to be important. In this connection he said in part:

"Under 'Automatic Train Stop,' the Commission in its proposed order has eliminated entirely the following paragraph in the requirements of the A. R. A. committee:

"'(b) Under control of engineman, who may, if alert, forestall automatic brake application and proceed.'

"The omission of this paragraph will make the use of a simple automatic train stop so restrictive that it will practically eliminate such devices from consideration. It is fundamental that trains should be stopped only when necessary in connection with their service or when necessary in the interest of safety. There are many times when it is proper for a train to pass an automatic signal in the stop position without coming to a full stop. Signals are now very generally located only a short distance from a siding switch and it is often desirable for a train to be admitted to a siding by a man on the ground, either a switch-tender or a trainman of another train. If no permissive device is allowed on the engine, it will be impossible for the engineman of the approaching train to pass the signal and enter the siding without having his train brought to a stop unnecessarily by the automatic device.

"* * * If an order is entered by the Commission it should be so flexible as to permit the installation of the simpler devices. The most that can now be expected from any automatic device is to have it operate when the human element fails to do so through inadvertence or physical inability. An engineman must be relied upon a great many times to exercise judgment and caution and it is entirely illogical to take from him, in one particular, his right to use his intelligence and discretion and at the same time rely on such intelligence and discretion at many other points. * * *"

The question of interchangeability was also raised by Mr. Burt. In order to get full protection from an automatic train control device upon engines, it must be so designed that it will function with the roadside apparatus on any of the railroads over which these engines operate. * * * In considering the necessity for interchangeability it should be remembered that the railroads would have to carry a stock of repair parts at various points on their lines. Before making large installations it is of the greatest importance that, so far as possible, there should be standardization. It will readily be conceded that the need for absolute interchangeability is not the same as the need for interchangeability in freight car couplers or air brake apparatus. There is, however, a very real need and this need of interchangeability will increase as time goes on rather than lessen. The major problems in connection with it should be brought much nearer to solution before extended installations of train control devices are undertaken."

Mr. Peabody Reports on Three Devices

J. A. Peabody presented reports on the American Train Control Company's installation on the Chesapeake & Ohio, the Miller Train Control Corporation's device on the Chicago & Eastern Illinois and the Regan device on the Chicago, Rock Island & Pacific. A brief description of the device was first given and the objections raised by the chief inspectors

were stated, after which was set forth the action taken by the companies to meet criticisms. He presented in each case a comparison showing how the device met the requirements laid down in the Commission's proposed order. Data sheets were presented showing the number of operations per failure, etc., and conclusions were drawn as to the effect of these devices upon train operation.

On the Chesapeake & Ohio, 32 specific points were brought up for correction; on the Chicago & Eastern Illinois, 13, and on the Chicago, Rock Island & Pacific, 29.

After the presentation of this information, in which all failures were noted, W. P. Borland, Chief of the Bureau of Safety, Interstate Commerce Commission, stated that he did not concur in this report, inasmuch as his inspectors did not co-operate with the special American Railway Association committee in the preparation of the document presented by Mr. Peabody and that a number of objections were raised which had not been concurred in by inspectors from his department. Mr. Peabody replied that he did not say the Bureau of Safety had co-operated, but that it did concur in pointing out certain undesirable features. Commissioner Esch then asked if the additional undesirable features (which had not been concurred in by the Bureau) had been called to the attention of the owners of the devices, and Mr. Peabody stated that they had not, so far as he knew; the report had only been finished during the last week. Its main purpose was to show that the train control question was in the development stage. Commissioner Esch asked Mr. Peabody if it was the primary purpose of the committee to find defects and Mr. Peabody said that it was; this in order to determine what is necessary to get reliability.

Pleas of Individual Roads

After the conclusion of the joint presentation, the Southern Pacific and the Southern Railway presented additional briefs pertaining to their particular roads. The Southern Pacific desired to adopt the responses made by the carriers' committee and further asked to be exempted from making a double installation, the Southern Pacific and the Galveston, Harrisburg & San Antonio being parts of the same system. It was the feeling of this company that the order should not apply to it, inasmuch as it is now co-operating in the development of an induction type near San Francisco.

The Southern Railway also supported the carriers' committee report and asked that it be not required to make duplicate installations which would be necessary if the order were to be entered, as the C. N. O. & T. P. was part of the Southern system. Automatic train control devices should not be required on these lines until additional automatic signals have been installed. W. J. Eck, signal superintendent, said that "the Southern Railway and the C. N. O. & T. P. have not been remiss in the installation of safety devices of all kinds; they have been among the first in this regard. They expect to continue the policy in the future; and when the principal main lines of the system are provided with other safety devices now recognized as desirable for a well regulated railroad, your honorable commission may be assured that this system will not hesitate to install automatic train control. The management is interested in the subject, has assisted in its development and will doubtless some day have it installed on many miles. It does not believe, however, that it should be installed now upon an entire engine division so long as there are hundreds of miles of important main lines without the very great safety afforded by the automatic block system. * * *"

A Plea for Signals

B. H Mann, signal engineer of the Missouri Pacific, said that an order as to his road would be premature. It should be permitted to expend its available funds in providing interlocking for its unprotected crossings and automatic block signals for its main lines before paying for a device to compel obedience to signals. He estimated the cost of equipping the line from St. Louis to Kansas City with an automatic train control system at $911,950, for 276 miles, and said the company should spend $19,251,000 for automatic signals and interlocking. The estimate for automatic train control, he said, was $1,500 per mile and $750 per locomotive, and was based on information from other roads that have made installations. He thought the 49 roads should not be required to spend money for the installation of a device which would be scrapped when a more satisfactory type is developed. The Missouri Pacific feels that its important problem is to reduce the unproductive time of freight trains, which can be done by signals, and it trusts that the Commission will not compel it to disrupt its present plans. It hopes that it may be relieved of the order entirely and allowed to devote its available revenues to other safety devices. Mr. Mann referred to the installation of signals as preparatory to automatic train control.

Chairman McChord asked how long it would take to complete the signal program. Mr. Mann replied that it would take several years. W. P. Borland, director of the Bureau of Safety, then brought out that the Missouri Pacific has installed automatic block signals on 365 miles since 1904, and 154 miles since 1912, and said that at that rate it would take over 100 years to "prepare for automatic train control." In reply to questions, Mr. Mann said that passenger engines run through from St. Louis to Kansas City and that passenger crews run through to Sedalia. He was asked the cost of installing train control between St. Louis and Jefferson City and said $316,200, but that that is not a crew run. He said his company has been looking into the Bostwick device and the three ramp types investigated by the committee.

Means Installation on Entire Line

When W. D. Duke, general manager of the Richmond, Fredericksburg & Potomac, said he desired to adopt the testimony presented on behalf of the committee, Chairman McChord reminded him that he was under oath. Mr. Duke said the proposed order covers his entire main line from Washington to Richmond, over which locomotives of six foreign lines are operated. He said that in the present state of the art, his company should not be required to install a safety device not thoroughly approved in actual practice. Proprietors of three or four devices have been permitted to use the company's tracks and locomotives for experiments during the past six or eight years, but the experience has not justified adopting any of them; he thought further time should be allowed for development of the induction type. He suggested 12 to 18 months as possibly sufficient time. Mr. McChord asked if the road is taking any steps itself to make tests on its own line. Mr. Duke replied that it expected to profit by the experience of others. Mr. McChord said that it seems to be the policy of Congress that something should be done, and that he understood that many good devices have never been tested. "We think we have done our share in proportion to our mileage," said Mr. Duke.

L. W. Baldwin, vice-president of the Illinois Central, asked that an order be not issued as to his road, saying that more time should be allowed. Commissioner Lewis asked how much time should be allowed. Mr. Baldwin said that would depend on the period required for development beyond the experimental stage. He said he had based his conclusions on what he had read and on reports of his officers; he had not personally studied automatic train control on the ground. Mr. Borland asked Mr. Baldwin what difference there was in operating conditions on the C. & E. I., the Rock Island or the Chesapeake & Ohio (which have reported that the train control devices used by them had met their operating conditions satisfactorily) and those on the Illinois Central. Mr. Baldwin said there is a difference of opinion

on that subject. While he was not familiar in detail with the operating conditions on the other roads, he did not see how it could be said that operating conditions were being satisfactorily met until those roads should be fully equipped. The Illinois Central has looked into the Sprague device and that of the Union Switch & Signal Co., to some extent, but is not testing any device.

Severe Winters

B. R. Pollock, vice-president and general manager of the Boston & Maine, asked that his road be exempted from any order, on the ground that it operates in a district of severe winter weather in which the practicability of automatic train control has not yet been demonstrated; and that the portion of its line designated was one of very heavy passenger traffic which would be adversely affected by any device which should cause additional stops. He said the locomotives of three other divisions also are run over this division so that the order would require the equipment of many additional engines.

C. C. Hine, general solicitor of the Chicago, Indianapolis & Louisville, said that his operating officers know very little about train control devices, but he wished to file an objection on the ground that an order as to his road would not be justified because its operating conditions are such that the additional protection is not required. Of the 475 miles of main line, 360 are equipped with automatic signals and on the lines where there are no signals there are long intervals between trains. No passenger has been killed in a train accident since 1897, except a mail clerk, in 1912, and the company feels that the money could be spent to better advantage for additional protection at highway crossings.

C. H. Stein, general manager of the Central of New Jersey, said his company is not opposed to automatic train control but is in sympathy with the proposition; but it has investigated 46 devices and feels that none of them has reached such a state of perfection that would warrant the expense of an installation. He believed that new possibilities are just coming to the surface and that a wireless device may be developed. Pointing out that in recent years only from 252 to 271 passengers have been killed per annum, and that only a part of these could have been saved by automatic train control, Mr. Stein said that the train control device itself might easily be the cause of accidents. Those now in service are under special scrutiny. He thought the capital required might be more profitably invested in other directions. In reply to Chairman McChord's question as to what his company is doing to help bring train control to a stage of perfection, Mr. Stein said it was keeping in touch with the experiments being carried on but does not feel like duplicating the work being done on other roads until it finds a device it considers worth trying.

"Suppose all the roads took the same position," said Mr. McChord.

"Then maybe we would take it up," replied Mr. Stein.

Mr. Borland asked Mr. Stein if he saw any insuperable difficulties in the way of standardizing the equipment to overcome the objections made on the ground of lack of interchangeability. Mr. Stein said that would be a question for the mechanical department. When he concluded, Chairman McChord asked Mr. Stein to file with the Commission the reports of the investigations of the 46 devices referred to.

Offered Prize for Device

The New York, New Haven & Hartford gave a long list of reasons why the order should not be issued on its line. No device had been found practicable for use on the lines covered in the Commission's order and the company has been trying to find a device since 1912, having offered a reward of $10,000 for such a one. Over 1,400 patent papers have been examined and innumerable inventors and proprietors of devices had been dealt with. Inspections have been made of practically all installations on other roads, and since 1918 the company had employed a special engineer who devoted all his time to this subject; and in addition a special committee was at work. The company showed that it had made a trial installation of the Union Switch & Signal Company's device in 1913 and of the International Signal Company's device from 1915 to 1917, but the tests were found unsatisfactory. Another objection raised to the issuance of the order was that in the operating of its trains over the Pennsylvania and the New York Central in electrified territory no automatic stop shoe could be used that would come within the allowable clearance.

During the presentation of the New York, Chicago & St. Louis road's brief, by Mr. Denney, Commissioner McChord asked about the work of the subcommittee, operating under Mr. Denney's direction, saying that Mr. Borland had no record of what occurred in connection with its inspection of the Regan and the Miller devices; while the inspector of the Bureau of Safety on the C. & O. had no knowledge of what these men were doing; and that the records of this subcommittee do not check up with the Commission's records. Mr. McChord also wished to know the conditions under which this subcommittee conducted the surprise tests.

The Burden of Two Installations

W. M. Jeffers, general manager of the Union Pacific, asked that that system be relieved of the burden of making two installations, as would be required by the proposed order, one on the Union Pacific and one on the Oregon & Washington Railroad & Navigation Company, and expressed the opinion that the test on an entire engine district is not essential, but said that the road desires to co-operate in a helpful way with the commission and offered to co-operate with the Bureau of Safety in making a test of any proper device which is not being tested. Chairman McChord said it was not the policy of the Bureau of Safety to say what devices should be installed. Mr. Jeffers said he thought the Union Pacific had spent more money per mile in safety work than any other road and that 85 per cent of its main line is equipped with block signals, but it feels that train control is still in its infancy and he knew of no device that he would want to put on extensively. There are many problems to be worked out, particularly in connection with heavy tonnage trains on grades.

He also made a point of the fact that train control would tend to take control of the train away from the engineer and said it is a question whether this remedy would not be worse than the disease. Mr. Borland asked if he had any idea that it was proposed to take the responsibility away from the engineer. Mr. Jeffers replied that he did not know that it was specifically proposed but any time responsibility is divided between the engineer and a device there is liability to trouble. When Mr. Borland cited two accidents on the Union Pacific caused by the failure of the engineer to see signals, Mr. Jeffers agreed that those accidents might have been prevented by an automatic train control device, but he said the device might have caused an accident on some of the hundreds of thousands of movements made since. Mr. Jeffers said that the ramp adds an unnecessary element of danger and that it would leave insufficient clearance for the rotary snow plow. He also thought the tendency would be to reduce the air pressure in descending heavy grades, saying that it takes years of experience for an engineman to learn how to handle his train under such conditions. Commissioner Esch asked whether he thought there was any objection on the part of those interested in wayside signals for fear that automatic train control would supplant them. Mr. Jeffers replied that he thought not because automatic train control should be used in conjunction with signals.

A. W. Trenholm, vice-president of the Chicago, St. Paul, Minneapolis & Omaha, said that the division of his road mentioned in the order has been proposed for double tracking, which would necessitate changing the apparatus if it were installed at this time, and he also said that it would be necessary to install automatic block signals at the same time. He submitted an estimate of the cost, saying he did not know whether it could be relied on and that probably an order of the commission would result in increase in the price of automatic train control. He discussed the financial condition of his road to show that it would be difficult to sell securities to meet the expense and said that the money could be used to better advantage for additional double tracking or signalling. He pointed out that crossing accidents had resulted in more casualties than collisions.

When Mr. Trenholm referred to the proposed order as arbitrary, Commissioner Esch said that Congress had passed the law two years ago and that the commission had waited this length of time before issuing an order. Mr. Trenholm replied that the law had left the matter in the discretion of the commission and he thought the burden should be on the patentees to perfect their systems until they are safe to put on a railroad. Mr. Esch said that in view of the stagnation in the development of train control in recent years Congress evidently expected some action on the part of the commission.

A. M. Burt was recalled to speak for the Northern Pacific. He described the expenditures made by this road for safety appliances and the proposed extensions of its automatic block signals. He said that the installation would not be warranted by the density of traffic on the divisions proposed in the order and that the ramp would introduce complications in a country exposed to snow drifts, because it would promote the formation of drifts and would also be an obstruction to the snow plows.

Five Installations Required on One System

W. E. Elliott, signal engineer of the New York Central, described the work which that company has done for many years in investigating train control, after C. C. Paulding, as counsel for the road, had pointed out that the proposed order would require five installations on the New York Central System, on the Pittsburgh & Lake Erie, Boston & Albany, Michigan Central, Chicago, Cincinnati, Cleveland & St. Louis, and the New York Central itself. Mr. Elliott said he had had experience in investigating train control since 1893 when the Chicago, Milwaukee & St. Paul, of which he was then signal engineer, made an experimental installation of the Kinsman device. He said that the special committee organized by the New York Central had adopted a train control device several years ago for use in the Detroit tunnel, but had not yet been convinced of the practicability of any device for general installation. He referred to negotiations with the Sprague Company since 1914 and said that under arrangements made during the winter its device has been installed on one track 6½ miles long, including five blocks, and on one passenger engine and preliminary tests were begun on February 20. Specific tests under the direction of the joint committee and the Bureau of Safety are to be made next week. If the tests turn out satisfactorily it is the intention to equip a double track section of the New York Central and Michigan Central between Toledo and Detroit, 54 miles, with automatic signals and an automatic train control device for a service test. He said the ramp type would not be suited to the New York Central because of interference with the third rail and because of the snow and ice conditions during the winter.

Mr. Peabody, appearing for the Chicago & North Western, said that the installation would cost $1,657,700 and the company felt that this money could be spent more profitably for block signals. George J. Ray, chief engineer of the Delaware, Lackawanna & Western, said his company had devoted much attention to tests of automatic train control devices for many years, and it does not ask for postponement of the order because of its financial condition or because of a belief that signals should be installed first, because the greater part of its line is already equipped with automatic signals and it is ready to install a train control device whenever it is convinced that one is suitable for its operation and would be a help rather than a hindrance, but if this order is made permanent it would have to instal a ramp type device and it believes that in a year or two some other type will have been developed more satisfactorily. Meantime, it believes it ought to be allowed to continue experiments.

Objects to Ramp

H. T. Douglas, chief engineer of the Chicago & Alton, said he believed that the ramp type is most undesirable and that the induction type will produce better results. He said that according to the best information he could obtain the installation on his road would cost over a million dollars and he thought it would be most unfortunate for the commission to require this expenditure for an experiment when there are so many other ways in which the money could be more profitably used, if it had the million dollars, which it has not. As various witnesses gave estimates of the cost, Chairman McChord asked for an itemized statement showing how the estimate was made up. Mr. Douglas said he had consulted men who had experience on other roads, but that the proprietors, he understood, were not in a position to give prices because they have no contracts for the manufacture. J. Beaumont stated that the manufacturers would be in a position to state prices and that such information has been available for some time.

F. P. Patenall, signal engineer of the Baltimore & Ohio, described the work his company has done in the way of investigating automatic train control devices and said that 75 per cent of them are "not worth the paper they are written on." Chairman McChord asked why the railroads have not done more to develop the other 25 per cent. Mr. Patenall said that no good purpose could be served by duplicating tests and that he felt his company had been of assistance in helping to ascertain changes that should be made in those that have been installed. He estimated the cost at from $2,000 to $6,000 a mile and said that greater benefit would be derived from the expenditure of this money for signals. He asked that the commission modify its order and permit an installation of 10 or 15 miles in connection with a proposed installation of signals. A number of the roads were asked by Chairman McChord to file statements of the cost involved in some of the principal accidents that have occurred in recent years, and also any other accidents which could have been prevented by train control.

Following the railroad testimony the representatives of train control companies were to be heard.

SOUTHERN PACIFIC SAFETY RECORD.—The total number of injuries sustained by employees of the Southern Pacific's Pacific System was approximately 20 per cent less in 1921 than in any other year since 1906.

STOP, LOOK AND LIVE.—With the first warm days of spring, automobiles will again take to the highways. The death rate at grade crossing is growing year by year. The evil may only be met by education. The Buffalo, Rochester & Pittsburgh Railway will issue warning bulletins from time to time during the summer, and these cards will be distributed to automobile clubs, gas stations and other suitable localities. In educational work the automobile clubs have accomplished wonders; we ask them to double their efforts. Our aim in this educational work is entirely unselfish and is entirely human. * * *—*B. R. & P. Circular.*

Freight Car Loading

Washington, D. C.

THE NUMBER of cars loaded with revenue freight showed another increase during the week ended March 11, according to the weekly report of the Car Service Division of the American Railway Association, to 829,128, as compared with 700,440 during the corresponding week of 1921 and 819,329 in 1920. The increase as compared with the previous week was 26,000 cars. The principal increase as compared with last year was in coal loading, 68,000 cars, but there was also an increase of 21,000 cars in miscellaneous freight and of 29,000 in merchandise. Decreases as compared with last year were shown only as to forest products and ore. Increases as compared with 1920 were shown as to grain and grain products, livestock, coal and merchandise. All districts showed increases as compared with last year. The summary for the week is given in the table below and the trend is shown in the chart.

The freight car surplus for the week ending March 8 was 223,846, a reduction of 21,254 as compared with February 28. Of the total 88,974 were box cars and 86,464 were coal cars.

The percentage of bad order freight cars on March 1 was 14.7 as compared with 14.5 per cent on February 15.

Announcement Regarding Consolidation Hearings

WASHINGTON, D. C.

FOR THE GUIDANCE of respondents and others to be represented at the hearing on the Interstate Commerce Commission's consolidation plan on April 24, at Washington, the commission has issued an announcement as to certain phases of the subject to be borne in mind.

The evidence received at the hearing beginning on that date will be confined to railway properties in the southeastern region as that region is described and referred to in Chapter IV of the appendix to the tentative plan of the commission, adopted August 3, 1921.

It was there found for the purposes of this tentative plan that the railway properties in that region may be consolidated under the statute into the following systems:

SYSTEM No. 10.—SOUTHERN

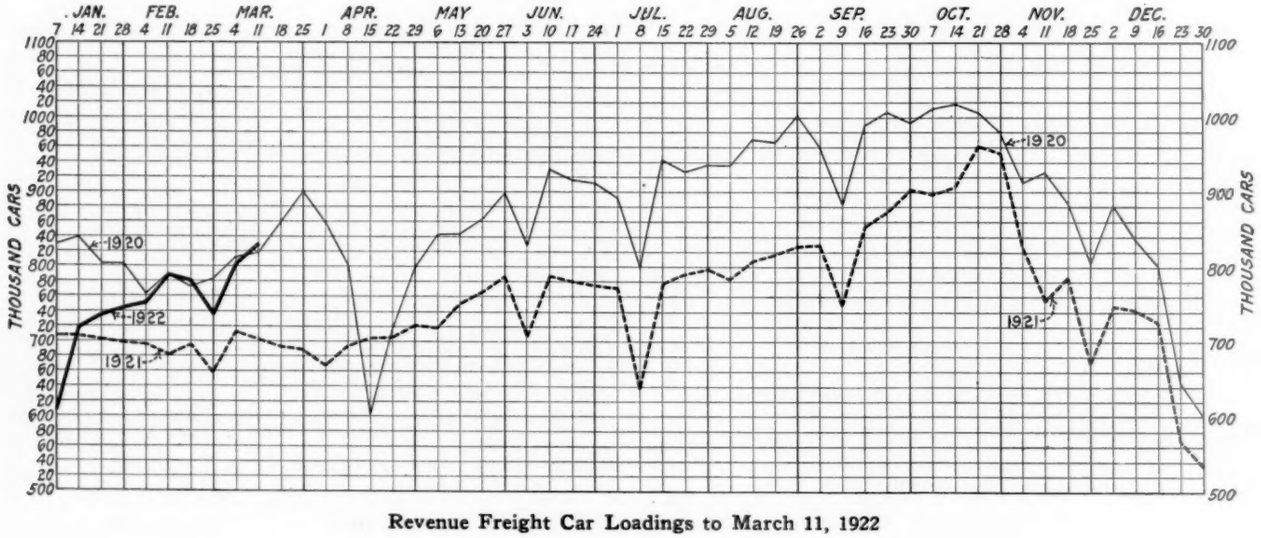
Southern
- Alabama Great Southern
- Georgia, Southern & Florida
- Mobile & Ohio
- Southern Railway in Mississippi
- Northern Alabama
- Cincinnati, New Orleans & Texas Pacific
- New Orleans Great Northern
- Alabama & Vicksburg

Note.—Prof. Ripley recommends inclusion of the Georgia Southern & Florida Branch from Valdosta, Ga., to Palatka, Fla., in Seaboard system.

REVENUE FREIGHT LOADED AND RECEIVED FROM CONNECTIONS

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. WEEK ENDED SATURDAY, MARCH 11, 1922.

Districts	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Mdse. L.C.L.	Miscellaneous	Total revenue freight loaded: This year, 1922	Corresponding year, 1921	Corresponding year, 1920
Eastern	1922	8,512	2,882	54,551	1,908	4,898	919	67,734	67,726	209,130	.....	.....
	1921	6,066	2,439	41,172	915	6,612	948	52,549	55,527	.....	166,228	192,685
Allegheny	1922	2,645	2,525	57,552	4,128	2,408	1,386	50,147	52,787	173,578	.....	.....
	1921	1,939	2,605	42,235	4,178	2,555	1,574	40,437	45,907	.....	141,430	176,801
Pocahontas	1922	225	74	26,417	232	1,100	15	5,931	3,555	37,549	.....	.....
	1921	**156**	**75**	**13,234**	**169**	1,339	10	4,973	3,217	.....	23,173	33,611
Southern	1922	3,727	2,341	26,109	520	15,711	552	37,979	41,270	128,209	.....	.....
	1921	3,229	1,982	17,134	563	13,813	925	36,267	38,177	.....	112,090	126,302
Northwestern	1922	12,706	9,308	10,623	1,249	15,460	617	27,206	29,812	106,981	.....	.....
	1921	10,464	8,513	5,021	1,010	16,542	866	25,327	28,667	.....	96,410	112,773
Central Western	1922	11,763	10,354	23,521	314	4,359	952	31,237	31,402	113,902	.....	.....
	1921	11,505	10,032	13,646	158	4,352	2,248	30,327	31,338	.....	103,606	115,029
Southwestern	1922	5,582	2,446	5,795	179	7,184	666	16,010	21,917	59,779	.....	.....
	1921	4,869	1,726	3,477	99	6,053	426	16,831	24,022	.....	57,503	62,128
Total, all roads	1922	45,160	29,930	204,568	8,530	51,120	5,107	236,244	248,469	829,128	.....	.....
	1921	38,228	27,372	135,919	7,092	51,266	6,997	206,711	226,855	.....	700,440	.....
	1920	32,721	28,109	184,808	9,797	63,273	14,604	157,690	328,327	.....	.....	819,329
Increase compared	1921	6,932	2,558	68,649	1,438	.....	.....	29,533	21,614	128,688	.....	.....
Decrease compared	1921	.....	.....	.....	.....	146	1,890	.....	.....	.....	.....	.....
Increase compared	1920	12,439	1,821	19,760	.....	.....	.....	78,554	.....	9,799	.....	.....
Decrease compared	1920	.....	.....	.....	1,267	12,153	9,497	.....	79,858	.....	.....	.....
March 11	1922	45,160	29,930	204,568	8,530	51,120	5,107	236,244	248,469	829,128	700,440	819,329
March 4	1922	49,520	28,329	196,639	8,257	47,664	4,651	231,433	236,762	803,255	711,367	811,106
Feb. 25	1922	46,729	27,740	187,447	8,072	47,704	4,330	199,157	214,107	735,286	659,642	783,295
Feb. 18	1922	54,209	30,327	190,700	7,666	50,796	4,034	219,050	224,142	780,924	692,007	772,102
Feb. 11	1922	*54,704	30,274	*193,377	7,823	52,638	4,015	222,908	222,673	788,412	687,867	786,633



Revenue Freight Car Loadings to March 11, 1922

SYSTEM No. 11.—ATLANTIC COAST LINE—LOUISVILLE & NASHVILLE

Atlantic Coast Line
Atlanta and West Point
Charleston & Western Carolina
Louisville & Nashville
Nashville, Chattanooga & St. Louis
Louisville, Henderson & St. Louis
Western Railway of Alabama
Richmond, Fredericksburg & Potomac
Norfolk Southern
Atlanta, Birmingham & Atlantic
Winston-Salem Southbound
Roanoke to Winston-Salem branch of Norfolk & Western
Florida East Coast
Carolina, Clinchfield & Ohio
Georgia & Florida
Gulf, Mobile & Northern
Mississippi Central

Notes—Prof. Ripley recommends that the Richmond, Fredericksburg & Potomac and Florida East Coast retain their present status without inclusion in any system.

The Carolina, Clinchfield & Ohio may be included in system No. 12, Illinois Central-Seabord. Prof. Ripley recommends inclusion in system No. 10, Southern.

The Gulf, Mobile & Northern and Mississippi Central are not specifically included in any system under Prof. Ripley's report.

SYSTEM No. 12.—ILLINOIS CENTRAL-SEABOARD

Illinois Central
Yazoo & Mississippi Valley
Central of Georgia
Seaboard Air Line
Lynchburg, Va., to Durham, N. C., branch of Norfolk & Western
Gulf & Ship Island
Tennessee Central
Carolina, Clinchfield & Ohio

Notes.—Prof. Ripley recommends that a separate system be built around the Seabord Air Line.

The Gulf & Ship Island is not included in any system by Prof. Ripley.

The Carolina, Clinchfield & Ohio may be included in system No. 11, Atlantic Coast Line-Louisville & Nashville.

In so far as practicable, the commission says, evidence should be presented in respect of these railway properties in the order in which they are listed in each system, and all evidence with respect to one system, e. g., System No. 10.—Southern, should be completed before passing to the next system.

Evidence as to the carriers not included in the tentative plan, such as industrial and terminal carriers should be presented in connection with that as to the system in which it is believed that they should be included.

In order that the evidence may be confined to relevant matters attention is also directed to paragraph (4) of section 5 of the Interstate Commerce Act.

Summarized, the requirements with which the commission must comply in preparing a plan for consolidating the railway properties into a limited number of systems, are:

(1) Competition must be preserved as fully as possible;

(2) Existing routes and channels of trade and commerce must be maintained;

(3) Subject to (1) and (2) the several systems must be so arranged that the cost of transportation as between competitive systems and as related to the values of the properties through which the service is rendered shall be the same, so far as practicable, so that these systems can employ uniform rates in the movement of competitive traffic and under efficient management earn substantially the same rate of return upon the value of their respective railway properties.

Attention is also directed to paragraph (6) of the same section, which reads as follows:

(6) It shall be lawful for two or more carriers by railroad, subject to this act, to consolidate their properties or any part thereof, into one corporation for the ownership, management, and operation of the properties theretofore in separate ownership, management, and operation, under the following conditions:

(a) The proposed consolidation must be in harmony with and in furtherance of the complete plan of consolidation mentioned in paragraph (5) and must be approved by the commission;

(b) The bonds at par of the corporation which is to become the owner of the consolidated properties, together with the outstanding capital stock at par of such corporation, shall not exceed the value of the consolidation properties as determined by the commission. The value of the properties sought to be consolidated shall be ascertained by the commission under section 19-a of this act, and it shall be the duty of the commission to proceed immediately, to the ascertainment of such value for the properties involved in a proposed consolidation upon the filing of the application for such consolidation.

"It will be seen," the commission says, "that stress is laid throughout upon the value of the properties to be consolidated, but that value will not be a controlling factor until application is made for the consolidation of two or more railway properties after the complete plan shall have been adopted. It would seem, therefore, that evidence as to value will not be helpful, if indeed material, at the present stage of the inquiry, and certainly not evidence as to the financial structure of the respective carriers. This has particular reference to the contention that the credit of the so-called strong roads will be impaired by consolidation with so-called weak roads, weak in many instances in the sense that they have not had the benefit of conservative financial policies.

"The statute contemplates consolidation into one corporation for the ownership, management and operation of the properties theretofore in separate ownership, management and operation. This would seem to exclude from consideration general projects or proposals based in whole or in substantial part on contemplated running rights, trackage agreements, and the like, or on new construction.

"As stated in 63 I. C. C., 455, the tentative plan was put forward in order to elicit a full record upon which the plan to be ultimately adopted can rest, and without prejudgment of any matter which may be presented upon that record. This announcement should not be construed as indicating in detail what evidence should be adduced. The purpose is to again call attention to the broad general grounds of the statute on which the complete plan must rest. It is understood, of course, that alternative or modified plans may be submitted in lieu of any system proposed in the tentative plan."

THE STATE OF MINNESOTA received from its 40 railroads for 1921, on account of the five-per-cent gross earnings tax, $1,762,651 less than in 1920, the aggregate gross earnings reported by the roads being only $146,011,564, or $35,241,457 less than the year before. No major road reported an increase in earnings from its Minnesota operations during 1921. The railroads which suffered most were the ore-carriers.

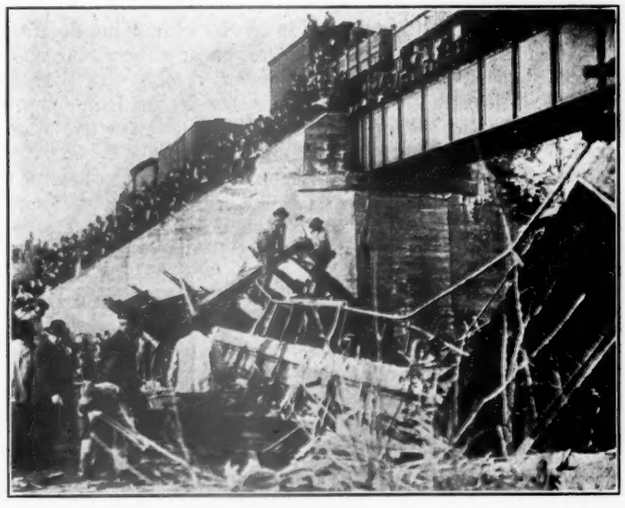


Photo by Underwood & Underwood

Accident Near Union City, Georgia, March 13, Thought to Have Been Caused by a Broken Wheel

Treated Water Improves Locomotive Performance

Six Years' Use of Soda Ash Demonstrates Value in Avoiding Failures, Reducing Repairs and Saving Fuel

By W. A. Pownall
Mechanical Engineer, Wabash Railway

THE ARTICLE on Interior Treatment of Boiler Water by C. R. Knowles of the Illinois Central, published in the *Railway Age* of November 12, 1921, deals with a very important subject and seems to have inspired considerable comment from railroad and supply men actively interested in this question. The writer has always taken great interest in the matter of scale prevention in boilers because of the large financial returns possible and would like to present for the information of those interested the results of systematic methods of boiler water treatment as in effect on the Wabash for the past 10 years.

Tests of Soda Ash Treatment

During the period 1902 to 1906, extensive service tests of soda ash treatment and observations of results were made on one of the large railroads. These tests showed conclusively that the treatment of all waters with enough soda ash to neutralize the sulphate hardness and provide enough excess always to show an excess of sodium carbonate in water drawn from the boiler, in connection with the systematic blowing off of the boiler through a blowoff cock properly located would accomplish the following principal results:

(1) Keep heating surfaces comparatively free from scale. (2) Cause the scale forming solids, instead of crystallizing on the heating surface, to be deposited as a soft sludge and be carried back to the point of least circulation, the back mud ring, where it could be removed through means of a perforated pipe connected to the blow-off cock in the back corner. (3) Practically eliminate engine failures due to leaking flues, fire boxes, stay bolts, mud rings, etc. (4) Reduce stay bolt breakage and fire box renewals to a very low figure. (5) Decrease the cost of boiler repairs from 30 to 65 percent. (6) Increase mileage between boiler washings to any desired amount. The tests also established the fact that the boiler would foam when the total dissolved solids were about 240 parts per 100,000 and that enough blowing off must be done always to keep below that point.

With full knowledge that these results were being obtained and that all methods were based not on any theorizing as to effects, but on actual observations of results, the Wabash started this method of treating water in roadside supply tanks with soda ash only and at every station where water contained any sulphates of lime and magnesia. Waters containing natural sodium carbonate, even though having a hardness of 20 to 40 parts per 100,000 are used in stationary boilers at several of our plants and do not form scale, the boilers being free from scale after having been in service for many years. Observations of boilers using this type of water ought to be evidence enough to any thoughtful investigator that similar results can be obtained on other waters containing sulphate hardness if enough soda ash is added to neutralize this hardness, or in other words to make it like the natural non-scaling water.

Let me emphasize, before discussing results, the fact that this method demands that all sulphate hardness waters over an operating district must be treated in order to obtain results. Treatment here and there by soda ash only will give practically no good results, and it is probable that experience with this sort of partial treatment has condemned this method in many cases.

Water treatment was started on the Wabash in 1912, and gradually extended until complete in 1916, when the total number of waters treated was 109. On one division this company operates over another road, and has not therefore been in a position to treat the water at roadside tanks. However, treatment has just been started on this division by placing enough soda ash in the tank at the terminal to treat all water used over the division, and although this is a crude method and one needing careful supervision, the results at the present writing are encouraging.

Engine Failures Due to Leaky Flues, Staybolts, Fireboxes, Etc.

A failure due to boiler leaking is an expensive failure since it usually involves giving up the train and having another engine and crew come out after the train and failed engine. Aside from the expense, leaking boiler failures are an absolute indication, particularly in cold weather, as to whether or not heating surfaces have scale on them, and are also evidence of all the other incidental troubles that go with scale. The following table shows the improvement in reducing failures due to leaking for the year 1921, as compared with the year 1911, the year before treatment was started.

ENGINE FAILURES DUE TO LEAKING FLUES, FIREBOXES, ETC.

Division	No. of failures 1911	No. of failures 1921	Per cent Decrease	Miles per failure 1911	Miles per failure 1921
Detroit	141	0	100.0	21,653	No failures
Peru	236	2	99.1	12,811	1,160,425
Decatur	232	4	98.3	20,878	989,068
Springfield	57	0	100.0	33,303	No failures
Moberly	265	23	91.3	25,596	248,035
Total	931	29	96.9	20,770	541,748

It will be noted that on two divisions the failures were entirely eliminated, on two other divisions they were practically eliminated and for all divisions the percentage of decrease was 96.9. The mileage per failure increased from 20,700 in 1911 to 541,748 in 1921. This improvement has not been made through the welding of flues into sheets, as this has been done on only a few engines and only on the superheater flues on divisions where the erratic water conditions and necessity for occasional use of very bad water made it seem advisable to weld in some of the superheater flues after they have been in service a year or two.

A good example of what has been accomplished is shown by the performance of 25 2-10-2 engines placed in service in July, 1917, on what was before treatment considered the hardest water division. These engines have flues 23 ft. long. During the 4½ years of service there have been seven failures due to leaking flues. The average time to first resetting of flues was 39 months, thirteen of the engines making from 40 to 48 months actual service. The average flue mileage on the ten highest engines (and one has not yet had the flues reset) is 116,477. Each engine has 3,047 staybolts including 2,320 rigid stays, 639 American flexible stays and 88 Tate flexible staybolts. There have been only 14 staybolts broken on the entire 25 engines. There are passenger engines running on this same division with nearly 300,000 miles between flue resetting.

Fire Box and Staybolt Renewals

Up to 1915 the firebox work on the Wabash was rather heavy, and the road did not begin to really feel the effect of water treatment in decreased firebox renewals until after 1915. However, from that time on there was a steady decrease in the number of new fireboxes applied each year, the

records for the last three years showing a reduction in firebox renewals of 93 per cent over 1915. At the same time there have not been many renewals of side sheets or part side sheets. It is to be expected that there will be certain cycles of firebox life and that there may be in the future a few years with heavier firebox renewal, but generally speaking the indications are that obsolescence will overtake renewal.

The records of staybolt renewals per locomotive per year show that on the best treated division about one bolt per locomotive per year is renewed, whereas on the one division that has not had treated water, and which is not a really bad water division, the broken bolts per locomotive per year are 52. The broken bolts on the heaviest power on the Wabash consisting of Pacific, Consolidation, Mikado and Santa Fe type locomotives, all of which operate under treated water conditions, was from June, 1920, to July, 1921, only 0.77 bolts per locomotive per year. These locomotives are equipped with flexible staybolts in the breaking zones only.

Fuel Performance

Keeping heating surface free from scale results in considerable fuel saving. As a rough method of showing the fuel saving the total tons of coal used in locomotive service each year have been divided by total equivalent ton miles, obtained by assigning an increased ton mile value to passenger car ton miles and assuming that switch engine ton miles is a function of freight ton miles. The omission of a separate figure for switching service ton miles explains what may appear to be a high value for "lb. of coal per ton mile." This figure was kept up to 1919 and shows the following:

Year ending June 30.	1912	1913	1914	1915	1916	1919 (Dec. 31)
Lb. coal equivalent per 100 ton miles	32.7	31.65	30.93	29.2	27.0	25.75
Per cent decrease over 1912	0	3.21	5.41	10.69	17.41	21.25

The decrease in fuel consumption from the year previous to water treatment to 1919 was 21.25 per cent, part of which can be attributed to extended use of superheater engines and brick arch, and the formation of a competent fuel organization.

Cost of Water Treatment

Considerable has been said in articles in the *Railway Age* about the heavy cost of blowing out. The officers of the Wabash realize that considering the waste of fuel and water, the cost of blowing off is possibly the major part of the cost of water treatment, but there is no guess work as to this expense. On an ordinary division where the treatment will average 0.6 lb. of soda ash per 1,000 gallons of water, after the engine has made several hundred miles since the boiler was washed, it will then be necessary to blow out about 4 per cent of the water to keep below the foaming point. This will entail a fuel waste of approximately 1.1 per cent of the coal used, and the total cost of the coal and water wasted would be about $0.026 per 1,000 gallons. The average cost between washouts will be less than this, since very little blowing is done after washout until the concentration has reached the foaming point. This cost should always be considered as a part of the cost of water treatment. Under ordinary conditions it is usually cheaper to blow out a boiler than to wash it out at the terminal, but this cost of blowing out should never deter one from treating water, as it is much more than offset by fuel saving from clean heating surfaces and by other attendant benefits.

One thing that is very essential to the successful use of treated water is the support of the enginemen. It is their intelligent use of the blow-off cock that makes it possible to use this method of treatment. Blowing off a glass of water when the engine reaches its terminal relieves the engineman of part of the burden, but in freight service it is still necessary for considerable blowing off to be done between terminals.

I have read carefully the various articles brought about by Mr. Knowles' paper, and I do not feel like criticising any of the statements made but simply wish to present results that speak for themselves, and which will always be open to investigation by anybody interested. As regards the use of boiler compound, I agree with Mr. Bardwell—there is no mystery. It is a clean-cut proposition in which one knows what is used for treatment, and knowing what is in the water, and the amount of treatment applied, should know what to expect in the way of results. The use of anti-foaming compound reduces the amount of blowing off necessary, and where the alkali salts in the treated water are not very high and it is not desired to make large mileage between washouts or water changes, the use of the anti-foaming compound should make it possible to get along without blowing off. On districts where the natural alkali salts are high, the anti-foaming compound is a necessity for practical operation.

The statement made by Mr. Coyle of the Great Northern, that a foaming point of 200 grains per gallon had been settled on because it happened to be the foaming point in a boiler where a lot of sludge and fine scale was set loose, does not agree with our experience. We have found through analyses of many thousands of waters taken from locomotive boilers which have been free from scale for years, that the water will foam when the concentration of dissolved solids is about 240 parts per 100,000. This varies somewhat; it will be a little lower if there is any unusual amount of mud in the water or decayed vegetable matter, and will run a little higher when all waters are clear.

Wabash boiler waters are in general not high in sulphate hardness, although rather high in total hardness, so that when untreated they form heavy scale. We appreciate that waters on railroads further west and in the Southwest are in many cases very high in sulphates as well as in foaming solids, and that treatment presents a much more serious and difficult problem than we have had to deal with.

Any steam user who does not use some method of treatment to prevent scale formation in his boilers is over-looking an opportunity to save much money. Whether scale prevention is to be accomplished by the use of boiler compound, by soda ash, or by water softeners is governed by financial conditions—any method pays; but any one of these methods in order to be successful must be accompanied by proper and intelligent supervision. The greatest argument against the treatment with soda ash alone is the foaming tendency of the treated water or the cost of blowing off to overcome this foaming tendency. If all waters were treated through the softener the low amount of lime solids in the treated water would make it possible to run with higher concentration before foaming took place, and consequently with a lower cost for blowing off. Information as to how high concentration can be carried in the boiler water before foaming takes place when all waters are treated through softeners could possibly be furnished by a few roads that have a complete division or divisions equipped with softeners. This figure may be rather high where anti-foaming compound is used in connection with the completely softened water. On the other hand, there is the possibility of some one, or several plants not operating properly at all times which would mean an increase in lime solids with resultant foaming concentration not much greater than with other methods of treatment.

The saving due to reducing blowing off can be figured at a definite value per 1,000 gallons of water and set against the interest, depreciation and operating charges for the softeners. Similarly, costs can be figured in determining whether the use of anti-foaming compound to reduce the amount of blowing off would be profitable. Some value should be attached to the psychological effect on enginemen of not having to do so much blowing off.

Nothing in the foregoing should be construed as in opposition to any method of treatment. Each method, if properly supervised, may accomplish from partial to complete results in scale prevention, and I have merely tried to show results which have been obtained on the Wabash through the use of soda ash, and are possible on any other railroad.

General News Department

The Post Office Appropriation Bill as passed by the Senate on March 20 carries an item of $93,000,000 for inland transportation by railroad routes.

The Railway Accounting Officers' Association will hold its annual meeting at the Hotel Cleveland, Cleveland, Ohio, beginning Wednesday, June 7. It was previously announced that the meeting would be held beginning June 14.

Representative Beck has introduced in the House of Representatives a bill authorizing the Interstate Commerce Commission to approve or disapprove contracts involving the construction or repair of locomotive engines, cars and maintenance work for railroads engaged in interstate commerce.

The freight transfer station of the Delaware, Lackawanna & Western at Scranton, Pa., employing about 100 men, is to be operated under contract by Downey Brothers, of Binghamton, N. Y. According to local reports the pay of the men will be only about six per cent lower than they have received from the railroad company.

The Chicago, Rock Island & Pacific is consulting with radio-phone experts with a view of determining if it is practicable to install complete radio-phone and radiograph outfits on its Rocky Mountain Limited and Golden State Limited trains, to provide passengers with news bulletins during the day and with musical concerts during the evening.

The Interstate Commerce Commission has issued an order giving additional regulations for the recovery and payment of excess railway operating income for the year ended December 31, 1921, under the provisions of Section 15-a of the interstate commerce act. The commission had previously issued a similar order covering the income in 1920. Reports for 1921 are to be submitted on or before May 1, 1922.

Rock Island to Issue Historical Booklet

The Chicago, Rock Island & Pacific, in connection with the observance of the 70th anniversary of the road, next October, will distribute a booklet giving interesting historical facts regarding the development of the road since the first passenger train was run from Chicago to Joliet, Ill., on October 10, 1852. This was the same year that the first railroad train reached Chicago from the east.

Repeal of New Jersey Full-Crew Law

The legislature of New Jersey has repealed the full-crew law of that state, passed in 1913, and amended in 1917, and has enacted a new law, under which employees may apply to the State Utilities Commission if they have complaints to make concerning the number of men employed in the crews of trains on the railroads of the state. The action of the legislature was vetoed by the governor, but was at once passed over the veto.

Thirty-four Indicted for Theft at Buffalo

Employees of the New York Central indicted in court at Buffalo, N. Y., on March 16, in connection with thefts of freight, numbered, with their accomplices, thirty-four. This includes a number of the company's police force, and some former policemen who were dismissed about three months ago. It is said that the indictments are based on evidence, given before the grand jury, to the effect that extensive plans were in operation, covering large freight yards in Buffalo and at other places, and that employees of the road were found to be in collusion with burglars. It is said that the thieving ring has been in existence for three years and that during the past 12 months it has carried off large quantities of whiskey and alcohol.

Pacific Railway Club

At the annual meeting of the Pacific Railway Club held at Oakland, Cal., on March 9, the following officers were chosen for the ensuing year: President, F. S. Foote, professor of railroad engineering, University of California; first vice-president, J. N. Clark, chief, fuel bureau, Southern Pacific; treasurer, R. G. Harmon, chief clerk, traffic department, Western Pacific and Denver & Rio Grande railroads. William S. Wollner (N. W. P.), who has been secretary of the club since its organization, was reelected for another year.

New Haven to Speed Up Settlement of Freight Claims

Freight claim agents, to deal directly with shippers and consignees, have been appointed on the New York, New Haven & Hartford for each of the nine divisions of the road; and, as a rule, these agents will adjust loss and damage claims for not more than $300 on their own authority, obviating the delay incident to correspondence with the general office. This road also, some months ago, adopted a rule under which the local freight agents at 43 stations are at liberty, when, in their judgment, it is wise to do so, to settle freight claims not exceeding $50.

Lackawanna Agrees Not to Reduce Wages of Enginemen

The Delaware, Lackawanna & Western and its enginemen and firemen, represented by the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen, have agreed upon wages and working conditions affecting these employees. The contract, which runs to April 1, 1923, and thereafter unless cancelled, calls for the maintenance of present wage rates and working conditions during the life of the contract, excepting that if changes are made in the basis of overtime payment on other Eastern railroads as a result of agreement between management and employees or by a decision of the Labor Board, such changes will also be made effective on the Lackawanna insofar only as they apply to payment for overtime work.

Unit Costs of Train Operation

The average cost per freight train mile, for the selected accounts which the Interstate Commerce Commission uses to indicate unit costs of train service, for the year 1921 was $1.799, according to the commission's monthly bulletin for December and 12 months, as compared with $2.054 in 1920, a reduction of 12 per cent. Reductions were shown for each of the accounts used. The cost of coal per net ton, including freight, was $4.10 as compared with $4.20 in 1920. The total of these selected accounts per 1,000 gross ton miles was $1.253 as compared with $1.424 in 1920, a reduction of 11 per cent, and the cost per passenger train mile was $.993 as compared with $1.098, a reduction of about 10 per cent. The selected accounts are locomotive repairs, engine house expenses, enginemen, trainmen, fuel and other locomotive and train supplies.

National Engineer Standards

The movement to develop national engineering standards sponsored by the American Engineering Standards Committee has made considerable progress during the past year. Among the standards approved during 1921 are method of sampling coal, a safety code for the protection of the heads and eyes of industrial workers, specifications for steel automatic screw stock and specifications and tests for Portland cement. Standards before the committee at the close of the year included a national

electrical safety code, specifications for car and locomotive forgings and a safety code for abrasive wheels. Numerous other projects of direct interest to railroads are now in the hands of the committee. The activities of the American Engineering Standards Committee have developed to such an extent that there is now work under way on a total of 79 distinct projects in which 160 bodies of national importance are co-operating.

Seek Grade Elimination Work

Various city councils have been actively engaged during the past few weeks in pressing their demands on certain railroads for an explanation of tardiness in carrying out state commission orders for grade elimination work in the localities in question. The city council of Milwaukee, Wis., has requested a reason for the delay of the Chicago & North Western in separating certain grades on its line through the southwest side of that city. It is expected that similar requests will be made of the Chicago, Milwaukee & St. Paul for like work in the northwest side of Milwaukee. The city council of Akron, Ohio, has also prepared extensive plans for grade elimination work in that city, and states that several years ago the railroads had promised to undertake the work in conjunction with the city, just as soon as their finances warranted.

Demand for Copies of Testimony Before Senate Committee

The Senate has ordered printed as a Senate document 2,500 copies of Volume 4 of the testimony before the committee on interstate commerce in its general investigation of the railroad situation. This is the part including the testimony of Walker D. Hines and W. G. McAdoo. This action was proposed by Senator Kendrick of Wyoming, who originally asked that Volume 3 be also included, but withdrew the request because the cost of the two exceeded the limit ($500) beyond which the Senate may not authorize printing without the concurrence of the House. Senator Cummins stated that the request would undoubtedly be followed by requests for other parts of the testimony, as there has been a very widespread demand for it, and the copies which the committee was authorized to have printed have been exhausted. He said that of Volume 3, covering 450 or 500 pages of the testimony of Frank J. Warne, the witness for the labor unions, 15,000 or 20,000 had been ordered by certain unions, who had paid for them; but the printing had worn out the type so that if the entire testimony is to be reprinted that part would have to be reset.

RAILWAY REVENUES FOR JANUARY, 1922, AND LAST YEAR

	1922	1921
Average number of miles operated	235,388.82	234,888.55
Revenues:		
Freight	$276,473,266	$324,934,826
Passenger	[2]83,720,061	[3]105,243,307
Mail	7,375,700	8,220,831
Express	6,519,221	7,441,230
All other transportation	12,025,806	13,433,588
Incidental	8,392,282	10,596,054
Joint facility, Cr.	607,740	704,211
Joint facility—Dr.	173,287	185,071
Railway operating revenues	394,940,789	470,388,976
Expenses:		
Maintenance of way and structures	48,666,568	60,756,654
Maintenance of equipment	93,506,246	124,077,708
Traffic	7,170,601	7,342,614
Transportation	171,137,867	230,812,638
Miscellaneous operations	3,689,267	4,522,229
General	13,514,767	15,262,423
Transportation for investment—Cr.	416,194	577,938
Railway operating expenses	337,269,122	442,196,328
Net revenue from railway operations	57,671,667	28,192,648
Railway tax accruals	22,557,530	22,143,225
Uncollectible railway revenues	89,352	69,489
Railway operating income	35,024,785	5,979,934
Equipment rents—Dr. balance	4,050,053	3,130,334
Joint facility rent—Dr. balance	1,498,310	1,323,970
Net railway operating income	29,476,422	1,525,630
Ratio of expenses to revenues (per cent)	85.40	95.01

Note—Excludes Detroit, Toledo & Ironton report not having been filed at date of compilation.

[2]Includes $2,251,981, sleeping and parlor car surcharge.

[3]Includes $2,445,079, sleeping and parlor car surcharge.

Purdue University's Experimental Locomotive

The Purdue testing locomotive, Schenectady No. 3, will soon be placed in the shops of the Monon railway at Lafayette, Indiana, to undergo a general overhauling and receive the application of several new parts and economy devices. The placing of this locomotive in 1897 in the locomotive laboratory at Purdue was primarily the result of the efforts of W. F. M. Goss, then Dean of the Schools of Engineering. Co-ordinating with Dean Goss in his efforts was the generous interest manifested by the Schenectady Locomotive Works and various other manufacturers, chief among which were the following: Bethlehem Steel Company, American Steel Casting Company, Ashton Valve Mfg. Company, Detroit Lubricator Company, and the Keasby and Mattison Company. The product, known as Schenectady No. 2, was a saturated steam locomotive with a boiler designed to carry a pressure of 250 lb. per sq. in.

In 1910, certain modifications including new flue sheets, were made to provide for the application of a Schmidt superheater by the American Locomotive Company. The designation of the locomotive was then changed to Schenectady No. 3, the locomotive as it stands today in the locomotive laboratory.

The new work contemplates chiefly the application of new cylinders and outside valve gears. Donations towards this work have either been received or promised as follows: Baldwin Locomotive Works, new cylinders and piston valves, outside steampipes, pistons, crossheads and guides, main crank pins, and Walschaert valve gear complete; Locomotive Firebox Company, thermic syphon; Sunbeam Electric Company, complete headlight and cab lighting equipment; Nathan Mfg. Company, injectors, boiler checks and water glass; Locomotive Fuel Economizer Company, Boyce fuel economizer, and Southern Valve Gear Company, complete valve gear.

A. R. A. Acts on Power Brake Investigation

In the matter of the Interstate Commerce Commission's order relating to the investigation of power brakes and calling for certain information to be supplied by April 1, 1922, and further advising of hearing on the subject set for April 6, 1922, at Washington, the General Committee of the Mechanical Division of the American Railway Association at its meeting in Chicago, Tuesday, March 14, reached the following conclusions:

(a) That the time was not sufficient to assemble the data required: (b) that for the hearing on April 6 it is suggested each carrier send its representative to Washington with whatever information can be obtained by that date; (c) that the Committee on Safety Appliances of the Mechanical Division, consisting of C. E. Chambers (chairman), superintendent motive power and equipment, Central Railroad of New Jersey; C. E. Fuller, superintendent motive power and machinery, Union Pacific; W. J. Tollerton, general mechanical superintendent, Chicago, Rock Island & Pacific; J. T. Wallis, chief of motive power, Pennsylvania System; C. F. Giles, superintendent machinery, Louisville & Nashville, and T. H. Goodnow, superintendent car department, Chicago & North Western, be delegated to handle the matter for the association and that it be given any assistance necessary by the Train Brake and Signal Equipment Committee; (d) further, that the Committee on Safety Appliances be directed to advocate that present brake arrangements are satisfactory and that the percentage of mileage on grades is too small in proportion to total mileage to warrant any greater investment in brake appliances.

Subsequent to the meeting, it was requested that all information developed by each of the carriers and supplied to the Interstate Commerce Commission be forwarded to C. E. Chambers, superintendent of motive power and equipment, Central Railroad of New Jersey. If possible, a supplementary order will be obtained extending the time for supplying information and the date of the hearing.

Traffic News

R. A. Davis has been elected secretary of the Railway Traffic Club of Springfield, Ill., succeeding M. C. Lauterbach.

The Interstate Commerce Commission has reopened the various intrastate express rate cases for such oral argument or reargument as the commission may hereafter direct.

The "Pittsburgh Plus" hearings being conducted by John W. Bennett, examiner of the Federal Trade Commission, were resumed at Chicago on March 20. The principal witnesses heard the first day were George E. Lasker, managing partner of the Laskar Iron Works, Chicago, and Eugene H. Heller, president of the Hill Pump Valve Company, Chicago. Both witnesses maintained that Chicago and the West are discriminated against and that their industries suffer because of the practice.

Walker D. Hines Retained by I. C. C.

The Interstate Commerce Commission has retained the services of former Director General of Railroads, Walker D. Hines, to represent the commission in the court proceedings growing out of its order in the New England divisions case.

N. E. Freight Rates; Injunction Asked For

The Trunk lines, including all of the principal roads in Eastern territory, west of the Hudson river, except the Pennsylvania and the Baltimore & Ohio, joined in petitions to the United States District Court, at New York city, on March 20, asking for an injunction against the enforcement of the recent order of the Interstate Commerce Commission requiring the revision of the divisions, as between the Trunk lines and the New England lines, on through freight to and from New England points; which order would increase by 15 per cent the share allotted to the New England lines, and decrease the share accruing to the lines west of the Hudson river by a sum equal to the increase allotted to the New England lines. Plaintiffs allege that the order is arbitrary and is not within the lawful power of the Interstate Commerce Commission.

The New York Central, because of its lease of the Boston & Albany, filed a separate petition.

It is estimated that the amount which would be added to the receipts of the New England roads by the carrying out of the Commission's order would be $7,500,000 annually. It is understood that the Pennsylvania and the Baltimore & Ohio hope to induce the New Haven road to join in a comprehensive revision of all through freight rates. One objection to the action of the Commission is that it is a blanket order, not based on the actual conditions of any one rate or any class of traffic; or upon any suitable record of freight movement.

Arguments will be presented on March 30.

Rate Decision First Week of April

That the Interstate Commerce Commission hopes to be able to announce its decision in the general rate advance case about the first week in April was stated by Commissioner Esch at a hearing before the House committee on interstate and foreign commerce on March 21. The hearing was called to consider various bills to require the railroads or authorize the Interstate Commerce Commission to require the railroads to issue interchangeable mileage book tickets at reduced rates. Mr. Esch opposed the bill recently passed by the Senate, giving authority to the commission to require the issuance of mileage tickets at a rate to be determined by the commission, saying that a majority of the commission, including its legal division, believe it to be unconstitutional. He said the question whether a reduced rate mileage book should be required is one of policy for Congress to determine. The commission will enforce any law that Congress may pass, leaving its interpretation to the courts, but he raised the question whether a reduction on mileage books would not interfere with reductions in rates which would be open to the entire public and not limited to a class. He also said the effect of a reduction in the revenues of the carriers should be considered in view of the fact that the roads are earning less than 6 per cent.

Representative Kahn of California, advocated his bill providing for a rate of 2½ cents a mile and Senator Poindexter advocated the Senate bill.

Former Senator Hoke Smith of Georgia also appeared before the committee to advocate a reduced rate mileage book, on behalf of a number of commercial travelers' organizations.

Coal Production

Production of soft coal passed the 11,000,000 ton mark during the week ended March 11. The output is placed by the Geological Survey at 11,058,000 net tons, an increase of 505,000 tons over the week preceding. The bulletin calls attention to the fact that the present course of production is strangely like that in late September and October when consumers were purchasing in anticipation of a possible railroad strike. However, a further increase of 2,000,000 tons a week would be necessary to raise the current output to the level attained just before the mine strike of 1919.

I. C. C. and State Commissioners Confer

Relations between federal and state regulation of rates were discussed at a conference between members of the Interstate Commerce Commission and a committee of state railroad commissioners at Washington on March 17, called at the invitation of the Interstate Commerce Commission following suggestions made by Chief Justice Taft in the decision in the Wisconsin rate case that a plan of co-operation between state and federal authorities may obviate the necessity for rigid orders of the Interstate Commerce Commission affecting state rates.

No announcement was made of any results of the conference and it was stated that no arrangements had been made for another meeting. It is understood that the attitude of the state commissioners was such that no agreement could be reached until they have definitely ascertained whether they have a chance of success in their efforts to have Congress change the provisions of the transportation act from which the commission derived its authority to order statewide increases in intrastate rates. This attitude was indicated shortly before the conference by John E. Benton, general solicitor of the National Association of Railway & Utilities Commissioners, in a statement at a hearing before the House committee on interstate and foreign commerce on the bills to amend the law to meet the views of the state commissioners. He said: "It cannot be possible that anything which will cure the situation which has been laid before your committee can come out of agreements. The law is in such shape that the carriers are under no obligation to present applications for increases to the state authorities."

The Interstate Commerce Commission was represented at the conference by chairman McChord and Commissioners Hall, Esch, Lewis and Eastman, while the state commissions were represented by Carl D. Jackson, of the Wisconsin commission, president of the National Association of Railway and Utilities Commissioners; Clyde M. Reed, chairman of the Kansas commission; W. D. B. Ainey, of the Pennsylvania commission; Alexander Forward, of the Virginia commission; H. G. Taylor, of the Nebraska commission, and Henry G. Wells, of the Massachusetts commission.

EXPORTS OF FLOUR from Canada in the five months ending January aggregated 3,255,409 barrels, as compared with 2,935,789 barrels for the corresponding period of the previous year.

JOBS FOR TRAVELING PASSENGER AGENTS. The province of British Columbia has decided to have a "British Columbia Invitation Week" from April 3 to April 8, inclusive, when every man, woman and child in British Columbia is expected to write a letter to a family or friend inviting them to come and visit the Pacific Coast during the summer.

Commission and Court News

Interstate Commerce Commission

The commission has modified its order in the Texas intrastate rate case so as to exclude from its provisions rates on refined sugar in carloads from Sugarland, Tex., to Texas common points.

The commission has reopened the Oklahoma intrastate rate case for argument at Washington on March 30 on a motion to dismiss the proceeding made by the Oklahoma commission, and a motion for further hearing filed by the respondent carriers.

Coal Rate Division to Be Investigated

The commission has ordered an investigation concerning the propriety and reasonableness of the divisions accorded to the Baltimore & Ohio, the Norfolk & Western and the Chesapeake & Ohio out of the joint rates on bituminous coal to and from points on those lines and points in Michigan, Ohio, Indiana, Illinois and Michigan. The commission, in Ex Parte 74, had stated that divisions stated in specific amounts should be increased in the same percentages as the through rates; but the three roads mentioned filed a petition with the commission stating that their connecting lines had refused to accord them divisions as contemplated by tne commission's report.

State Commissions

The Oregon Public Service Commission and the Arizona Corporation Commission have issued orders requiring that commercial auto buses and trucks operating over the highways of those states be brought to a full stop before crossing railroad tracks. The orders are similar to those issued recently in California and Nevada.

Railroad Crossing for School Children

The Illinois Commerce Commission denied an application by the directors of a school district for the establishment of a grade crossing near a schoolhouse for the use of pupils, the power of the Commission in a matter of this kind being limited to granting its permission to establish a grade crossing of a highway over railroad tracks.

United States Supreme Court

Abandonment of Intrastate Road Is a Local Question

The United States Supreme Court in an opinion handed down on March 14 denied the authority of the Interstate Commerce Commission to authorize the abandonment of the Eastern Texas Railroad under the provisions of the Transportation act, 1920, on the ground that the railroad lies entirely within a single state, is owned and operated by a corporation of that state, is not a part of another line, and its continued operation cannot be a more than local concern. The case was brought by the state of Texas on appeal from the federal district courts, which had sustained the commission, the plea being that the commission's order was an encroachment upon the jurisdiction of the state. The court held that in this case interstate and foreign commerce will not be burdened or affected by any shortage in the earnings, nor will any carrier in such commerce have to bear or make good any shortage. The court said it was the intention of Congress to enact a law to regulate interstate and foreign commerce and to affect intrastate commerce only as may be incidental to the effective regulation and protection of interstate.

Opinion by Justice Van Devanter. The court decided not to pass upon the question whether the railroad company was entitled to abandon its line, because that question was not presented in this case. The opinion was unanimous.

Foreign Railway News

New Line from Chile to Argentina Authorized

The expenditure of some $16,000,000 has been authorized for the construction of a railway line connecting the Chilean coal fields in the south with the Buenos Aires Great Southern Railway at Zapata, Argentina, according to the Wall Street Journal. Financing will be arranged by taxes on fuel.

New Railway in Bolivia

The present session of the Bolivian Congress will, according to the Wall Street Journal, be asked to authorize financing to allow the construction of a railway from Potosi to Sucre, a distance of 121 miles. In 1918, 29 miles of this line was completed but nothing more was done because of the inability of the government to secure capital. It is believed that the government now has a definite proposal of financial backing and that the work can be undertaken if the congress gives the necessary authority.

All-Highway Freight Traffic in England

Motor truck competition presents a serious problem to the British railways. They use motor trucks themselves in carrying on their "store-door" delivery services, but few of the companies are privileged to engage in all-highway transportation. The following is from Commerce Reports:

"Railway companies in Great Britain are being offered serious competition by motor highway transport, which is making great headway and is viewed with considerable alarm by railway officials. High railway rates, an excellent system of highways, and the release of large numbers of motor vehicles formerly used for military purposes, together with the men who drove them, all combined with a winter climate not unduly severe, serve to advance this competition. However, in some quarters its importance is thought to be overestimated, because motor traffic will ultimately be compelled to bear its proportion of taxes for maintenance of the highways; furthermore, doubts exist as to whether any of the motor transport companies are setting aside the proper sums for repair and renewal of vehicles.

"Within certain limits road motor transport companies are considered common carriers and are subject to the provisions of the Transport Act of 1919, under which any person considering rates charged to be excessive may apply to justices of the peace; but this is rarely done in the case of motor transport companies. Aside from this, there is no legal limitation to the charges which they may impose.

"A comparison of the road transport companies' charges with those of railways is given in the following table of average rates per ton:

London to—		Road charges. s.	Road charges. d.	Rail charges. s.	Rail charges. d.
Bristol	per ton	43	9	59	4
Birmingham	"	45	0	56	10
Brighton	"	31	0	39	7
Leicester	"	44	0	52	6
Southampton	"	39	6	51	8

"Approximate haulage rate for an average distance of 12 miles by motor truck, including collection and delivery, is 7d. per ton-mile. For longer distances the rate is somewhat less, and for shorter distances the rate is relatively higher.

"In the report of a committee appointed by the Ministry of Transport to inquire into the question of railways engaging in road motor transport, it is pointed out that a considerable bulk of paying traffic is being diverted from the railways by road transport companies. It is the desire of the railways to recover this traffic for their own lines by means of road traction if necessary.

"The North Staffordshire and the Great Northern of Scotland railways have already obtained statutory powers to carry goods upon the highways, while the Lancashire & Yorkshire operates 13 services. The London & Northwestern

maintains a motor-car freight service between Manchester and Macclesfield and Buxton, and between Coventry and Nuneaton. The Midland has a similar service between Derby and Matlock districts; the London & Southwestern between London and Putney, Mortlake, Barnes, East Sheen, and Rosehampton; the Southeastern & Chatham provides service between London and Nunhead, Lewisham, Catford, Brockley, Blackheath, Lee, Herne Hill, and Penge. The carriers deliver to distances as far as 50 or 60 miles from their centers.

"The committee was not certain that railway companies should be permitted to proceed without limit in the development of road transport; but it was of the opinion that for developing districts in which no transport by independent road carriers existed railway companies might, with the consent of the Ministry of Transport, establish and operate such service for a limited period, even if conducted at a loss. Serious opposition has developed to the railways engaging in highway motor transportation, chamber of commerce, and agricultural and other associations feeling that it would result in a complete monopoly and nullification of the present competition.

"One of the largest transport concerns has developed the use of demountable truck bodies to a large extent, having over 400 in service in conjunction with 200 motor trucks. It is the opinion that for efficient operation there should be at least three bodies to each chassis, thus permitting one body to be left at starting point, one to be carried, and one waiting at destination. The loaded bodies are handled by a mechanical device, delays in loading and unloading are eliminated, and a wider use of the motor itself is made possible."

Czecho-Slovak Railways

The railway mileage of Czecho-Slovakia is 8,488, of which private companies operate about 610 miles. Of the government operated lines 590 miles are double tracked, according to Commerce Reports. A definite program of extension has been adopted by the government which calls for double tracking to bring the percentage of line mileage so equipped up to 16 per cent of the total; and for new lines totaling 346 miles.

There are 4,280 locomotives in the country and 106,250 cars, of which about 10,000 are for passenger train service. Equipment has been so far restored to normal that unserviceable locomotives represent but 14 per cent and bad order cars 8 per cent of the total.

Railway Car Builders Strike in Great Britain

LONDON.

Over 10,000 members of the Amalgamated Society of Railway Vehicle Builders, Wheelwrights, Carpenters and Mechanics are on strike against wage reductions proposed by the employers which it is stated would represent such heavy decreases as 40s. 9d. (approximately $9.90 at the normal rate of exchange) per week per man for piece work and 33s. ($8.02) per week per man for time work. Railway car builders and kindred workers all over the country are affected by the strike. Approximately 90 per cent of the members of the society are on piece work. In the year 1919 a production payment of 25 per cent was added to the wages earned above £3 ($14.58) per week on piece work.

The employers demand that wages should be reduced by 15 per cent on basic rates and that the 26s. 6d. ($6.44) weekly bonus should be eliminated. Nationally the employers are concentrating on piece work reductions, but in certain districts the employers are also asking that time workers should accept a reduction of 6s. 3d. ($1.52) per week, which is equal to a reduction of 10 per cent, in addition to the surrender of the weekly bonus of 26s. 6d. ($6.44).

The wages are now 110 per cent above the pre-war rates, but the employees contend that the pre-war standard was too low and that the present wage rates in view of the circumstances of the time and the altered conditions should remain operative. In January this year, the men accepted wage reductions of 10 per cent on piece work and 6s. ($1.46) per week on time work, in addition to having surrendered 7½ per cent of the 12½ per cent "Churchill" bonus.

Equipment and Supplies

Locomotives

THE NEW YORK CENTRAL is inquiring for 50, 0-8-0 type switching locomotives.

THE CHICAGO & NORTH WESTERN will probably buy 50 locomotives in the near future.

THE LOUISVILLE & NASHVILLE is inquiring for 6 Mikado type locomotives and 4, 0-8-0 switching locomotives.

THE STUDEBAKER CORPORATION, South Bend, Ind., has ordered 2, 0-6-0 type locomotives from the American Locomotive Company.

Freight Cars

THE SOUTHERN PACIFIC is inquiring for 2000 automobile box cars, of 55 tons capacity.

THE LOUISVILLE & NASHVILLE is inquiring for 500 all steel hopper cars, of 55 tons capacity; also for from 500 to 1,000 composite gondola cars, of 50 tons capacity.

THE CHICAGO & NORTH WESTERN noted in the *Railway Age* of March 11 as inquiring for 2750 freight cars, has put out an additional inquiry for 300 ballast cars and 50 tank cars.

THE NORFOLK & WESTERN, reported in *The Railway Age* of March 11 as inquiring for 4000 steel hopper cars, has ordered 1000 from the Standard Steel Car Company, 1000 from the American Car and Foundry Co., and 2000 from the Pressed Steel Car Company.

THE NEW YORK CENTRAL may place orders for several thousand new freight cars. As noted in the *Railway Age* of March 18, contracts have already been let for 1000 new cars. The company is also placing contracts for the repair of a large number of freight cars, including 300 cars to the Ryan Car Co.; and a number to the Streator Car Company, the Buffalo Steel Car Company and the Euclid Steel Car Company, for the Michigan Central; also 500 to the Ralston Steel Car Company, for the Toledo & Ohio Central. All the cars for repair are steel gondola and hopper cars.

Passenger Cars

THE MISSOURI, KANSAS & TEXAS has renewed its inquiry for 30 passenger cars.

THE CHESAPEAKE & OHIO is asking for bids on 30 all steel passenger coaches, 8 all steel combination passenger and baggage cars and 25 all steel express cars.

Iron and Steel

THE GREAT NORTHERN is inquiring for 380 tons of fabricated "I" beam spans for 59 steel bridges.

THE CHESAPEAKE & OHIO reported in the *Railway Age* of February 25 as inquiring for 21,000 tons of rail including 3,000 tons for the Hocking Valley, has placed orders as follows: Inland Steel Company, 9,000 tons, Illinois Steel Company 7,000 tons, Bethlehem Steel Company, 1,000 tons, and 3,000 tons with another company for the Hocking Valley.

Machinery and Tools

THE GREAT NORTHERN is inquiring for a 1,400-ton full hydropneumatic 52 in. car wheel press including a 7½ h. p. 3 phase 60 cycle, 440-volt motor complete with starter; 1, 24 in. vertical turret boring mill, including a 15 h. p. 3 phase, 60

cycle, 440-volt motor and starter with 1 set of standard tool equipment; 1, 36 in. heavy duty upright common drill press, including motor and starter; 1, 30 in. high duty lathe connected to suitable motor and starter; 1, 600-ton full hydropneumatic slanting head driving wheel press with 13 in. throat, with motor and starter; 1 throatless shear with suitable motor; 2 pneumatic riveting hammers for driving ½ in. rivets; 1, ½ in. double headbolt cutter with motor and full set of dies; 1 pipe threading machine for cutting ¼ in. to 2 in. pipe, with motor and dies; 1 crank pin turning tool; 1, No. 5, cylinder grinding machine for cylinders from 3 in. to 8 in.; 1, 15 h. p. 3 phase 60 cycle, 440-volt squirrel cage induction motor with starter; and 1, 30 in. selective head lathe 7 ft. between centers with motor and starter.

Miscellaneous

THE CHICAGO, MILWAUKEE & ST. PAUL is inquiring for its gasoline, kerosene and long time burner oil requirements for the period from April 1, 1922, to December 31, bids to be submitted before noon of March 27 at Chicago.

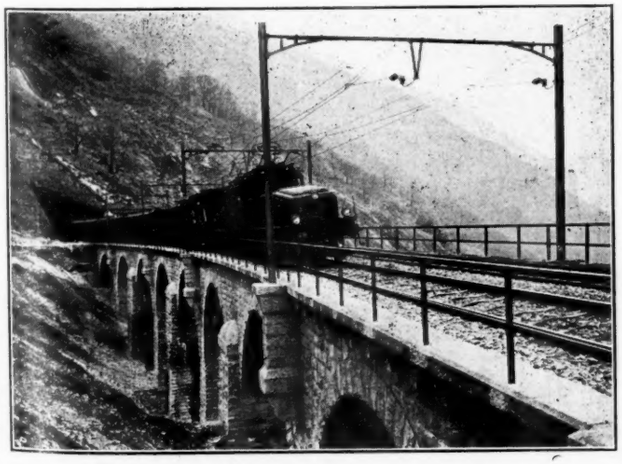
THE NEW YORK CENTRAL will receive bids until 12 o'clock noon March 31 for its requirements until July 1, 1922, for the Line Buffalo and East of fuel oil (paraffine base), gasoline, kerosene, long time burning semaphore oil, turpentine substitute coach candles, mineral seal oil, common black oil, West Virginia black oil and gas oil also for its requirements until May 1, 1922, for the Line Buffalo and East of asphaltum base fuel oil.

Signaling

THE MISSOURI PACIFIC has ordered a 12-lever Saxby & Farmer interlocking machine from the General Railway Signal Company, for installation at Columbia, La.; and also the same type of machine for a second installation at Alexandria, La. The construction work will be done by the railroad company's forces.

THE NORTHERN PACIFIC has let the contract for its automatic block signals to the General Railway Signal Company, Rochester, N. Y. These signals, as noted in our issue of March 15, page 625, are to equip the line from Fargo, N. D., to Mandan, 204 miles, of which 151 miles is single track and 53 miles double. Three-position upper-quadrant semaphores will be used.

THE GREAT NORTHERN has ordered from the General Railway Signal Company "A. P. B." automatic block signals system, for installation on single track between Newport, Wash., and Bonner's Ferry, Idaho; between Troy, and Rexford and between Whitefish and Strykers, Mont., an aggregate distance of 165 miles. Installation will be made by the signal company's forces.



On the Gothard Tunnel Line, Switzerland

Supply Trade News

J. Ross Bates, formerly with Vonhan Bates & Goode Trading Corporation, New York City and Boston, Mass., will in the future represent the Orton & Steinbrenner Company, Chicago. Mr. Bates has offices at 136 Liberty street, New York City, and 128 School street, Watertown, Mass.

George H. Green, who has been elected vice-president and secretary of the Universal Packing and Service Company, was born on December 19, 1886, at Chicago. He entered business in the testing department of the Chicago, Rock Island & Pacific in 1906 and during the succeeding eight years served as inspector and chief inspector of materials. In 1914, he was appointed railroad representative of the Garlock Packing Company, and two years later he entered the service of the National Waste Company as sales representative. During the war Mr. Green served as a lieutenant in the field artillery branch of the service and upon his return to this country entered the service of the National Waste Company. In 1919, he was elected vice-president of the company, which position he still retains in addition to his new duties with the Universal Packing and Service Company.

G. H. Green

John P. Landreth, who has been elected president and treasurer of the Universal Packing and Service Company, Chicago, was born at Beloit, Kan., on August 11, 1883, and attended the public schools and a business college at Joplin, Mo., and later the Missouri Military Academy at Mexico, Mo. He entered business with the Joplin Water Works Company, Joplin, Mo., as a collector and inspector of accounts. Later he served as a car clerk on the Denver & Rio Grande at Salida, Colo., and, in 1902, became associated with the English Iron Works at Kansas City, later entering the railway specialty sales department of this company at St. Louis. In 1904 he became associated with the Garlock Packing Company as traveling salesman, and on January 1, 1905, was transferred to St. Louis as city salesman. One year later he was placed in charge of the Kansas City office of the company and in May, 1908, was made Chicago manager, which position he held until July, 1916. On the latter date he was appointed western sales manager of the Anchor Packing Company of Philadelphia, Pa., with headquarters at Chicago, which position he still retains in addition to his duties as president and treasurer of the Universal Packing and Service Company.

J. P. Landreth

C. E. Skinner, manager of the research department of the **Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has been appointed assistant director of engineering. His duties will cover research, standards and other work along these lines. Mr. Skinner was born near Redfield, Ohio, on May 30, 1865, and was graduated in 1890 from Ohio State University. The same year he joined the Westinghouse organization in the controller department, and supervised the construction of the first controller turned out by that company. Soon afterward he was placed in charge of the testing of insulation, and in 1892 he was transferred to the research laboratory. In 1895 he was placed in charge of insulation design in the engineering department, taking charge, in 1902, of the insulation division of that department, together with the chemical and physical laboratories. Four years later he organized the research division, of which he has been in charge until his present promotion. In 1915 he was a special representative of the American Institute of Electrical Engineers, of which he is a fellow, at the international conference on electrical standards held in London, and he is now a member of the committee representing the Institute of the International Electrotechnical Commission. He was chairman of the American delegates to the Brussels meeting in 1920.

Merger of Machine Tool Manufacturers

Negotiations to merge a number of machine tool manufacturers are said to have been completed, according to recent announcement. The name of the new corporation has not yet been decided upon. The companies included in the merger are the Lodge & Shipley Machine Tool Company, Carlton Machine Tool Company, Newton Machine Tool Works, Inc., Betts Machine Company, Colburn Machine Tool Company, Hilles & Jones Company, Modern Tool Company, and the Dale Machinery Company.

Obituary

William Boughton, district representative at Detroit, Mich., of the Superheater Company, New York city, died at his home in Detroit on March 8, of heart disease. Mr. Boughton was born in Ontario county, New York, in 1861. He went to Saginaw, Mich., in 1876, and a year later began his railroad career with the Pere Marquette as a machinist's apprentice. Two years later he was advanced to brakeman, later to fireman, and in 1882 to engineman. In 1898, Mr. Boughton was promoted to road foreman of engines, and seven years later he was appointed master mechanic of the Saginaw division. In 1909 he became general master mechanic of the entire system and later was promoted to superintendent of motive power. He resigned from the service of the Pere Marquette in 1912 to become district representative at Detroit of the Superheater Company, New York city, which position he held at the time of his death.

Trade Publications

AUTOMATIC DRIVING BOX WEDGES.—The Franklin Railway Supply Company, New York, has issued a phantom view of the Franklin automatic adjustable driving box wedge showing the construction of the wedge and related parts and giving instructions for proper methods of lubrication.

GLASS TILE.—The Federal Cement Tile Company, Chicago, has issued a leaflet describing and illustrating a form of tile which it manufactures which contains wire glass panels for lighting purposes. The leaflet includes a view of an installation of this tile in roof construction and a list of other installations of these products.

CROSS TIES.—The Century Wood Preserving Company, Pittsburgh, Pa., has issued a 16-page booklet on the storing and seasoning of cross ties. The bulletin is chiefly reading matter directed to the end of discussing the various factors influencing air seasoning, tie deterioration, etc., and shows the proper methods of storing ties under various conditions. Aside from the reading matter, several illustrations are included to show actual views of ties in storage.

Railway Construction

ATCHISON, TOPEKA & SANTA FE.—This company, which was noted in the *Railway Age* of February 18 (page 453), as contemplating the construction of an extension to its lines from Owen, Okla., to Pawhuska, a distance of approximately 40 miles, has awarded a contract for this work to Maney Bros., Oklahoma City, Okla.

ATCHISON, TOPEKA & SANTA FE.—This company has been granted authority by the Kansas State Charter Board to construct a cut-off extending from Eldorado, Kans., to Ellinor, a distance of about 43 miles, to further include a four-mile belt line just east of Eldorado. This line will be known as the Eldorado & Santa Fe.

CANADIAN PACIFIC.—This company is now receiving bids for the construction of a freight terminal building at Windsor, Ont., to include a one-story office building 40 ft. by 60 ft., and a shed 40 ft. by 300 ft.

CANADIAN PACIFIC.—This company is asking for bids for the construction of a new bridge across the Coquitlam River, Vancouver, B. C., to replace the old one washed away during the heavy floods of November. The new structure, which will be built of steel, is to be about 300 feet long with concrete piers. The concrete abutments will be placed farther apart than in the former structure to make more allowance for another possible swelling of the river.

CHESAPEAKE & OHIO.—This company closed bids on March 22, for the construction of a 500-ton reinforced concrete coaling station at Peach Creek, W. Va., and one at Thurmond.

CHICAGO & ALTON.—This company, in conjunction with the residents of Greene and Jersey counties, Illinois, will construct an extension to its lines from Titus, Ill., to Reddish Road, a distance of about 3.77 miles, and a further extension from a point approximately half-way on this line, to Hardin, Ill., a distance of about 1.8 miles. Farmers in this vicinity will furnish the right-of-way and ties, and do the grading. The Illinois Commerce Commission has authorized this extension and a petition for permission to do this work is now on file with the Interstate Commerce Commission.

CHICAGO & EASTERN ILLINOIS.—This company, and the Pittsburgh, Cincinnati, Chicago & St. Louis, have been petitioned by Arthur, Ill., through the Illinois Commerce Commission, to construct a suitable station at that point.

CHICAGO & WESTERN INDIANA.—This company, which was noted in the *Railway Age* of March 4 (page 548), as having closed bids on February 28, for the remodeling of its passenger station at 63rd and Wallace streets, Chicago, has awarded a contract for this work to Rowley Bros., in that city.

CHICAGO, BURLINGTON & QUINCY.—This company has awarded a contract to John Griffiths & Sons, Chicago, for the remodeling of its 15-story office building in that city which was badly damaged by fire on March 15.

CHICAGO, BURLINGTON & QUINCY.—This company has awarded a contract to John Griffiths & Son for the construction of a four-story reinforced concrete and steel inbound freight house, 300 ft. by 700 ft., at Chicago, the foundation for which was completed some time ago. The same company contemplates the construction of a brick passenger station at Westmont (near Hinsdale), Ill., and one at Franklin, Neb.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—This company and the Lake Erie & Western have been petitioned by the city of Bloomington, Ill., through the Illinois Commerce Commission, to separate their grades at South Main street in that city.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—This company has applied to the Interstate Commerce Commission for authority to construct a 3.5 mile cut-off in Delaware county, Ohio.

DENVER & RIO GRANDE WESTERN.—This company contemplates the construction of a subway under its tracks near Overland Park, a suburb of Denver, Colo, although no definite plans have as yet been made for this project.

GREAT NORTHERN.—This company, which was noted in the *Railway Age* of February 11 (page 401), as contemplating the construction of a second main track between Williston, N. D., and Spring Brook, a distance of about 8 miles, has awarded a contract for the grading to A. Guthrie & Co., St. Paul, Minn., and for the bridge and culvert work, to W. F. Hill, Superior, Wis.

GREAT NORTHERN.—This company will soon receive bids for the construction of terminal facilities at Wenatchee, Wash., to include a 24-stall roundhouse, storehouse, coaling station, water supply equipment, boiler washing plant and other necessary buildings. As much material and equipment as possible will be reclaimed from the recently abandoned terminal at Bowdoin, Mont.

GREAT NORTHERN.—This company contemplates the construction of a one-story car repair shop 40 ft by 300 ft., at Minot, N. D., estimated to cost $85,000.

KANSAS, OKLAHOMA & GULF.—This company has petitioned the Kansas Public Utilities Commission for authority to construct an extension from Baxter Springs, Kan., to Military, a distance of about 6.5 miles, where a connection will be made with the Missouri, Kansas & Texas. It is expected that the hearing on this petition will be held the latter part of this month.

LEAVENWORTH & TOPEKA.—This company contemplates the construction of a new bridge across the Delaware river at Osawkie, Kan. An application for a loan has been made to the Interstate Commerce Commission, part of which is needed to finance this construction.

LOS ANGELES & SALT LAKE.—This company has petitioned the railroad commission of California for authority to construct a railroad from Fullerton, Cal., to Anaheim, in Orange county. This proposed road is an extension of a branch line, the work of which was commenced in 1916, and discontinued under federal control.

MICHIGAN CENTRAL.—This company closed bids on March 21, for the construction of a brick passenger station, 33 ft. by 94 ft., with slate roof, estimated to cost about $25,000, at Hastings, Mich.

MIDLAND VALLEY.—This company has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 100-ton frame coaling station at Panama, Okla., and a similar one at Lefeber.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company, in conjunction with the Chicago & North Western and the City of Ironwood, Mich., noted in the *Railway Age* of February 4, page 353, as receiving bids for the construction of a reinforced concrete viaduct 1,500 ft. in length over 23 tracks at Mansfield street, Ironwood, has awarded a contract for this work to the Albinson Construction Company, Minneapolis, Minn. The work will cost $92,700 and will be commenced at once.

NORTHERN PACIFIC.—This company contemplates the construction of a three-story combination brick passenger station and office building at Glendive, Mont., estimated to cost $150,000.

SOUTHERN.—This company will construct a second main track between Morristown, Tenn., and New Line, a distance of about 1.5 miles.

WABASH.—This company has been petitioned by Decatur, Ill., through the Illinois Commerce Commission to separate grades and construct a subway under its tracks at an intersection with a public highway, east of that city.

WASHINGTON, BRANDYWINE & POINT LOOKOUT.—This company has applied to the Interstate Commerce Commission for authority to increase its capital stock from $100,000 to $500,000 for the purpose of constructing an extension from Mechanicsville to Point Lookout, Md., with branches to Drum Harbor and St. Mary's City.

Railway Financial News

AKRON, CANTON & YOUNGSTOWN.—*Equipment Trust Certificates Authorized.*—The Interstate Commerce Commission has authorized this company to assume obligation and liability in respect of $270,000 of equipment trust certificates to be issued under the Akron, Canton & Youngstown engine trust of 1921 in connection with the procurement of nine locomotives.

ALABAMA GREAT SOUTHERN.—*Income Statement.*—The income statement for the year ended December 31, 1921, shows the following results:

Gross operating revenues	$9,542,225
Total operating expenses	8,196,320
Net revenue from operation	$1,345,905
Taxes and uncollectible railway revenue	328,422
Equipment and joint facility rents (Debit)	3,303
Railway operating income	$1,020,786
Other income	427,697
Total gross income	$1,448,483
Deductions from gross income	402,606
Total available income	$1,045,877
Interest on mortgaged, bonded and secured debt	510,787
Balance of income over charges	$535,090

APACHE.—*Application to Issue Securities Denied.*—The Interstate Commerce Commission has denied this company's application for authority to issue 550 shares of its capital stock and a promissory note for $455,000 to be secured by a second mortgage as not found compatible with the public interest and reasonably necessary for the proper performance of service to the public as a common carrier.

ASHLAND, ODANAH & MARENGO.—*Asks Authority to Abandon Line.*—This company has applied to the Interstate Commerce Commission for certificate authorizing the abandonment of its tracks which consist of about 20 miles running from Odanah, Wis., to certain lumber tracts on which the lumber has been cut.

ATLANTA & ST. ANDREWS BAY.—*Abandonment of Branch Line.*—The Interstate Commerce Commission has made public a proposed report of Attorney Examiner Clarke recommending that a certificate be issued authorizing the abandonment of the operation of a branch line between Panama City and St. Andrews Bay, Fla. This line was previously permitted to be abandoned for an experimental period, since which there has been a rehearing of the case.

ALTON & SOUTHERN.—*Guaranty Certified.*—The Interstate Commerce Commission has issued a certificate for $100,000 as due this company on account of its six months guaranty.

BUFFALO, ROCHESTER & PITTSBURGH.—*Guaranty Certified.*—The Interstate Commerce Commission has issued a certificate for $61,093 as representing the amount now due this company to make good its guaranty for the six months period of 1920.

CHICAGO & ALTON.—*Directors Resign.*—Charles Hayden and M. L. Bell have resigned as members of the board and of the executive committee.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—*Income Statement:*—The income statement for the year ending December 31, 1921 shows the following results:

Gross operating revenues	$17,170,446
Total operating expenses	14,789,237
Net revenue from operation	$2,381,209
Taxes and uncollectible railway revenue	651,633
Equipment and joint facility rents (Debit)	212,869
Railway operating income	$1,942,444
Other income	276,869
Total gross income	$2,219,313
Deductions from gross income	1,362,133
Total available income	$857,180
Interest on equipment obligations	153,645
Balance of income over charges	$703,535

DENVER & RIO GRANDE.—*Guaranty Certified.*—The Interstate Commerce Commission has issued a certificate placing the amount

necessary to make good this company's guaranty for the six months period of 1920 as $1,415,453 of which $477,953 is still due.

DULUTH & NORTHERN MINNESOTA.—*Abandonment of Line.*—The Interstate Commerce Commission has made public a proposed report of Attorney Examiner Clarke recommending that the commission affirm its former conclusion in authorizing a certificate for the abandonment of this company's line from Knife River to Cascade, Minn., 99.25 miles.

EL PASO & SOUTHWESTERN.—*Partial Payment on Guaranty.*—The Interstate Commerce Commission has certified to the treasury a partial payment of $500,000 on account of this company's guaranty for 1920.

ERIE.—*Authorized to Issue Bonds.*—The Interstate Commerce Commission has authorized an issue of $5,000,000 of consolidated mortgage 7 per cent extended bonds at such price as to make the average cost to the applicant not to exceed 7.30 per cent per annum to maturity, including all costs of negotiation and sale. The company is also authorized to pledge $2,500,000 of bonds pending their sale as security for short term notes and to pledge certain other bonds as security for a one-year, 6 per cent note for $10,000,000 to the War Finance Corporation.

GREAT NORTHERN.—*New Dividend Policy.*—In a letter to the stockholders Chairman Louis W. Hill explains the change in dividend payments from a quarterly to a semi-annual basis as follows:

Present cash situation of the company is satisfactory and funds are available from which the customary quarterly dividend could be paid, together with such other requirements as are apt to arise in the near future. It is of greatest importance, however, that this strong cash position should not be impaired and the directors believe it to be in the best interest of shareholders to ascertain more accurately the probable results of the present year before determining finally upon the dividend policy.

Even in normal times the directors could act on dividends with much more confidence in June than in March. Crop prospects always are an important factor; they are unknown in March of any year. Likewise the season's iron ore traffic, as well as the general business, is measurably determined by June 20.

Another important consideration is that the Chicago, Burlington & Quincy pays its dividends semi-annually in June and December, so that available funds from that source will be known in acting upon Great Northern dividends prior to August and February, respectively.

It is confidently hoped there will be such an improvement in business, and that such substantial additional reductions in wages and other costs shall be realized in advance of further rate reductions that on about June 20, when consideration must be given to the August 1 dividend, the directors will be justified in declaring a 3½ per cent semi-annual dividend.

The company has been fortunate in being able to continue its regular 7 per cent basis throughout the war and post-war period. In 1921, the most difficult year the railroads have ever experienced, the net income from railway operations available for dividends was only 3¼ per cent on its capital stock; but it received an extra dividend from the Chicago, Burlington & Quincy stock (of which it owns nearly 49 per cent) and by this means was able to pay the 7 per cent dividend out of 1921 income.

Two of the principal commodities handled by the Great Northern are products of agriculture and products of mines. The present unsatisfactory state of the agricultural industry generally is only too well known. In 1921 crops along the Great Northern lines were almost average in yield, but the prices received by the farmers were so low that the result of the season's farm operations showed little, if any, profit. It is impossible at this time to forecast agricultural results for the coming season. Iron ore traffic, which for a period of years has averaged 11,000,000 tons, in 1921 was only 4,300,000 tons, and it is not yet possible to forecast what it will be for the current year.

Operating expenses have been abnormally high. In 1921 they totaled nearly 80 per cent of gross revenues, compared with approximately 60 per cent in 1916, the last pre-war year. Cost of coal in 1921 was $13,000,000, or 2.4 times as much per ton as in 1916. The payroll, which is the largest single item of expense, being 58 per cent of the total, was in 1921, $47,000,000. The average pay per man per hour in 1921 was two and one-seventh times as much as in 1916. Officials of the Great Northern have endeavored to reach an agreement with employees on lower wages, but have failed. The dispute has been referred to the Labor Board, which is the only method of procedure under the law.

The present uncertainty is augmented by threatened trouble in the coal mining industry by wage controversies pending before the Labor Board, and by agitation for immediate further rate reductions.

In order to have even moderately successful results, we must have a larger volume of traffic and lower operating costs before any general reduction is made in freight rates.

The company is entitled to a reasonable return on the value of its property used for transportation purposes. Pending the determination of such value by the Interstate Commerce Commission, the book investment in road and equipment is being used as a basis of value. This basis, assuming that the Interstate Commerce Commission should decide 6 per cent is a fair return, would entitle the company to retain over $29,000,000 from railway operations after paying operating expenses. The actual value when fixed, should substantially increase this amount. Should it earn more than what is considered a fair return by the commission the company must pay to the government one-half of such excess earnings, but net earnings of $29,000,000, which we are clearly entitled to, are ample to pay all fixed charges and leave a safe margin after paying 7 per cent dividend. This, of course, comes about largely because in the past earnings have been put back into the property without being capitalized in any way.

See editorial in this issue entitled "The Great Northern Dividend."

JACKSONVILLE TERMINAL.—*Authorized to Issue Bonds.*—The Interstate Commerce Commission has authorized an issue of $3,100,000 of refunding and extension mortgage bonds of which $2,000,000 are to be exchanged for a like amount of first and general mortgage bonds and $1,100,000 are to be sold at not less than 95 and accrued interest and the proceeds used for capital purposes. The Atlantic Coast Line, Florida East Coast, Seaboard Air Line and Southern were authorized to guarantee the bonds.

MAINE CENTRAL.—*Annual Report.*—The corporate income account for the year ended December 31, 1921, compares as follows:

	1921	*1920
Operating revenues:		
Freight	$14,275,951	$12,645,031
Passenger	4,909,997	4,817,085
Total, including other	$20,590,064	$18,737,811
Operating expenses:		
Maintenance of way and structures	$3,926,106	$3,444,946
Maintenance of equipment	4,704,186	4,186,040
Traffic	158,741	149,474
Transportation	1,857,089	10,882,653
General	555,820	540,000
Total operating expenses	$19,533,352	$19,248,820
Net revenues from railway operations	1,056,712	Def. 511,009
Railway tax accruals	1,263,982	996,722
Railway operating income	Def. 210,180	Def. 1,509,611
Total non-operating income	623,037	†4,276,535
Gross income	412,857	2,766,924
Total deductions	2,578,219	2,462,491
Net income	Def. 2,165,362	304,433
Dividends (5 per cent on preferred; 6 per cent on common)		653,166
Sinking fund	15,691	19,138
Income balance	Def. 2,181,053	Def. 367,871

*Revenues and expenses are for the ten months, March to December.
†Includes two months' proportion of standard return due from United States Railroad Administration, and amount charged against the United States account of guaranty under the Transportation Act, for the six months, March to August, inclusive.

The annual report of the Maine Central is reviewed in an article on another page of this issue entitled "Maine Central Shows Deficit of $2,181,053."

MAXTON, ALMA & SOUTHBOUND.—*Application for Loan Denied.*—The Interstate Commerce Commission has denied this company's application for a loan of $84,290 on the ground that the public necessity for the line is small and its prospective earning power does not indicate sufficient security.

MIDLAND RAILWAY.—*Receivership.*—George M. Brinson, president of this company, has been appointed receiver. The road operates between Savannah and Stevens Crossing, Ga., 88 miles.

MINNEAPOLIS & ST. LOUIS.—*Directors Resign.*—Charles Hayden has resigned as a director and chairman and M. L. Bell has resigned as a director in accordance with the recent ruling of the Interstate Commerce Commission that they could not hold offices with the Chicago, Rock Island & Pacific and at the same time similar offices with the Minneapolis & St. Louis. Jules S. Bache has been elected chairman of the board. L. W. Baldwin and P. V. Davis have been elected to fill the vacancies on the board.

MISSOURI PACIFIC.—*Bonds Sold.*—Kuhn, Loeb & Co. have sold $18,000,000 first and refunding mortgage 6 per cent gold bonds, series "D," due February 1, 1949, at 98¾ per cent and accrued interest to yield about 6.10 per cent to maturity. The bonds are issued to provide funds for the retirement of $13,641,000 bonds maturing January 1, 1923, and to reimburse the company for other capital expenditures. The sale of these bonds is subject to the approval of the Interstate Commerce Commission.

NEW ORLEANS & NORTHEASTERN.—*Income Statement.*—The income statement for the year ended December 31, 1921, shows the following results:

Gross operating revenues	$6,329,586
Total operating expenses	5,854,466
Net revenue from operation	$475,120
Taxes and uncollectible railway revenue	583,017
Equipment and joint facility rents	151,693
Railway operating income	Def. $259,591
Other income	661,484
Total gross income	$401,893
Deductions from gross income	103,134
Total available income	$298,759
Interest on mortgaged, bonded and secured debt	405,637
Deficit for year	$106,878

NEW YORK CENTRAL.—*Separate Suit in New England Rate Case.*—This company will begin an independent suit in the New England rate case based upon the fact that it is the only trunk line system operating or controlling a line into New England. Under the Interstate Commerce Commission's order, which is now held up by a temporary injunction returnable March 30, the Boston & Albany, operated by the New York Central under lease, was excluded from the benefits of the 15 per cent increase in the New England share of the through rates, although the Boston & Albany operates wholly in New England. The New York Central will show that it has made expenditures of more than $36,000,000 on the Boston & Albany since it took over operation of the line in 1900.

NORFOLK & WESTERN.—*Authorized to Issue Bonds.*—The Interstate Commerce Commission has authorized an issue of $666,000 of first consolidated mortgage 4 per cent bonds to be sold at not less than 90 per cent of par and accrued interest and the proceeds to be used for reimbursement of the treasury for the payment of $600,000 of underlying bonds.

NORTHERN PACIFIC.—*Reduces Dividends.*—The directors have declared a quarterly dividend of 1¼ per cent, payable May 1 to stock of record April 12. This is a reduction of the rate from 7 per cent to 5 per cent annually.

Following the directors' meeting, Howard Elliott, chairman of the board, made the following statement:

"In declaring a dividend of 1¼ per cent payable May 1 to stockholders of record April 12, the directors feel they are best serving the interests of the stockholders and are hopeful that conditions will warrant the resumption of the rate of 1¾ per cent quarterly in the future."

Dividends at the rate of 7 per cent had been paid since 1903, with an extra of 11.26 per cent in 1908 from accumulated surplus of the Northwestern Improvement Company. In 1902 dividends were 5½ per cent, in 1900, 4 per cent, and initial payment 2 per cent in 1899.

PARIS-LYONS-MEDITERRANEAN.—*Bonds Sold.*—Kuhn, Loeb & Co., and the National City Company have sold $30,000,000 6 per cent external fund gold bonds, due August 15, 1958, at 83, and interest to yield about 7.35 per cent to maturity. In case of earlier redemption of the entire issue at 103 per cent, the yield gradually increases to a maximum of 8.78 per cent, if called on February 15, 1932, the earliest date on which the entire issue may be redeemed, and in case of any bonds redeemed at 100 per cent by the sinking fund to a maximum of 9.22 per cent as to any bonds redeemed on August 15, 1929.

An issue of £5,000,000 in bonds of the same type as the dollar issue was sold recently in London at 86—now quoted at 90⅝. The proceeds of the American issue are to be utilized for the purchase of additional rolling stock, electrification of some lines and other improvements.

RICHMOND, FREDERICKSBURG & POTOMAC.—*Sues City.*—This company has brought suit against the city of Richmond, Va., for $346,950. This suit is the outcome of the arrangements entered into in 1915 between the company and the city for the lowering of the railroad tracks along the James River branch of the railroad, running from Acca to James River, and the construction of bridges over Broad Street, Monument, Patterson and Grove Avenues. This work was completed on September 23, 1920. The company alleges the city promised to defray half the expenses of the work, but that it has not done so.

SOUTHERN RAILWAY.—*Income Statement.*—The income statement for the year ended December 31, 1921, shows the following results:

Gross operating revenue	$128,715,150
Total operating expenses	105,829,007
Net revenue from operation	$22,886,143
Taxes and uncollectible railway revenue	4,667,336
Equipment and joint facility rents	4,247,025
Railway operating income	$13,971,782
Other income	4,239,193
Total gross income	$18,210,975
Deductions from gross income	4,207,802
Total available income	$14,003,173
Interest on mortgaged, bonded and secured debt	11,976,550
Balance of income over charges	$2,026,623

TENNESSEE, ALABAMA & GEORGIA.—*Sale Postponed.*—There were no bids received when this road was offered for sale at Chattanooga, Tenn., on March 18, so the sale was postponed for the sixth time to April 1.

WISCONSIN CENTRAL.—*Stockholders' Committee Formed.*—Minority common stockholders of this road have formed a committee to inquire into the affairs and accounts of the company to determine whether it is receiving the full return to which it is entitled from the Minneapolis, St. Paul & Sault Ste. Marie Railway, as lessee. The committee consists of W. J. Wollman, chairman; John E. Fritsche, William Hamm, Harry E. Kohn and William P. Tuttle.

In a circular letter asking for the deposit of the common stock of the Wisconsin Central, the committee states that much stock was purchased when the Minneapolis, St. Paul & Sault Ste. Marie, controlled by the Canadian Pacific, made the lease, it being assumed that a large increase in the Wisconsin Central's gross and net earnings would result. While the expected increase in gross receipts occurred, the committee says, there has been no corresponding benefit to the common shareholders.

Sales of Equipment Trust Certificates

Director General Davis of the Railroad Administration has announced additional sales at par plus accrued interest, of railroad equipment trust certificates held by the government, to:

Messrs. Lamport, Barker & Jennings, New York, Northwestern Pacific, 1923 to 1935, incl.	$156,000
Alfred Borden, New York, Chicago Junction Railway, 1923 to 1935, inclu.	276,900
Detroit & Toledo Shore Lines, 1923 to 1935, incl.	289,900
	$722,800

The sales comprise approximately two-thirds of all the maturities of these equipment trust issues. The balance of one-third of all maturities will be stamped as subordinated, in accordance with the agreement as amended under the plan recently announced. The total amount of equipment trust certificates sold by the government to date, at par plus accrued interest, is $221,080,900.

Tentative Valuations

The Interstate Commerce Commission has issued tentative valuation reports in which it places the final value of the property of the Arizona Eastern as of 1915 at $10,681,198 for the property owned and $13,392,214 for the property used. The final value of the property of the Delray Terminal as of 1918 is placed at $154,264 and of the Duluth Terminal Railway as of 1916 at $515,000.

Railroad Administration Settlements

The United States Railroad Administration reports the following final settlements, and has paid out to the several roads the following amounts:

Central New York Southern	$42,500.00
Maxton, Alma & Southbound	13,500.00
Augusta Union Station	400.00
Tampa Union Station	11,500.00
Birmingham Terminal	1,824.78

The payment of these claims on final settlement is largely made up of balance of compensation due, but includes all other disputed items as between the railroad companies and the administration during the 26 months of federal control.

Dividends Declared

Cleveland, Cincinnati, Chicago & St. Louis.—1¼ per cent, quarterly, payable April 20 to holders of record March 31.

Kansas City Southern.—Preferred, 1 per cent, quarterly, payable April 15 to holders of record March 31.

Philadelphia & Trenton.—2½ per cent, quarterly, payable April 10 to holders of record April 1 to April 11.

Philadelphia & Western.—Preferred, 1¼ per cent, quarterly, payable April 15 to holders of record March 31.

Trend of Railway Stock and Bond Prices

	March 21	Last week	Last year
Average price of 20 representative railway stocks, close of business	61.18	61.45	54.14
Average price of 20 representative railway bonds, close of business	83.41	82.50	73.83

Railway Officers

Executive

J. B. Finley, general superintendent of the Southern Pacific of Mexico, with headquarters at Empalme, Sonora, Mex., has been promoted to vice-president and general manager, with the same headquarters, succeeding L. H. Long, retired.

Louis H. Long, vice-president of the Southern Pacific of Mexico, with headquarters at Tucson, Ariz., and of the Arizona Eastern, with the same headquarters, with supervision over both operating and engineering departments, retired from railroad service on March 1. Mr. Long was born in Solano county, Cal., and educated at the University of California. He began railroad work on September 20, 1885, in the service of the Southern Pacific on railroad location projects. Since that time he has been assistant engineer on location and construction; engineer in charge of construction; since February 1, 1909, chief engineer of the Southern Pacific of Mexico; and since July 15, 1913, vice-president of that road and the Arizona Eastern, which positions he has held up to the time of his recent retirement.

C. M. Scott, general manager of the Arizona Eastern, with headquarters at Phoenix, Ariz., has been elected vice-president and general manager, with the same headquarters, succeeding **L. H. Long,** retired. Mr. Scott was born in Hamilton county, Ohio, on April 10, 1872. He entered railroad service in 1890, as chief clerk in a trainmaster's office of the Baltimore & Ohio Southwestern, and was subsequently chief clerk in a superintendent's office, and train dispatcher. In 1896 he entered the service of the Chicago, Burlington & Quincy, as chief operator in the dispatcher's office at St. Joseph, Mo., and he later became secretary to the general superintendent. He left in 1900 to enter the service of the Atchison, Topeka & Santa Fe, in the general freight and passenger agent's office at Prescott, Ariz. The following year he was employed in the chief engineer's office, and later in the general manager's office of the same road, at Prescott. In 1905 he left to become secretary to the president of the Arizona Eastern and the Southern Pacific of Mexico at Tucson, Ariz. Later he became chief clerk to the president and in 1907 he was promoted to superintendent of the Phœnix division of the Arizona Eastern, with headquarters at Phœnix, which position he held until August, 1918, when he was promoted to general manager with the same headquarters. He was holding that position at the time of his recent election.

C. M. Scott

Operating

B. S. Barker, vice-president and general manager of the Gainesville & Northwestern, has resigned to become secretary of the Atlanta Chamber of Commerce, Atlanta, Ga.

J. H. Lambert, general freight and passenger agent and trainmaster of the Gainesville & Northwestern, has been appointed superintendent of this company, with headquarters at Gainesville, Ga.

E. A. Wheeler has been appointed chief dispatcher of the Medicine Hat division of the Canadian Pacific, with headquarters at Medicine Hat, Alta., succeeding **G. A. Davidson,** transferred.

Mechanical

F. S. Brown, mechanical engineer of the Erie, with headquarters at Meadville, Pa., has been appointed chief mechanical engineer with headquarters at New York and **G. T. Dupue** has been appointed mechanical superintendent of the Ohio and Chicago regions, with headquarters at Youngstown, Ohio, to succeed Charles James. **Winfield S. Haynes,** formerly master mechanic, with headquarters at Dunmore, Pa., has been appointed superintendent of shop operation with headquarters at New York. He will report directly to the general manager.

Engineering, Maintenance of Way and Signaling

C. K. Bowen, special engineer of the Southern Pacific of Mexico, with headquarters at Puga Nayarit, Mex., has been promoted to chief engineer, with headquarters at Empalme, Sonora, Mex., succeeding L. H. Long, retired.

J. C. McClure, assistant to the president of the Arizona Eastern, with headquarters at Tucson, Ariz., has been appointed chief engineer in addition to his present duties, with the same headquarters, succeeding L. H. Long, retired.

T. J. Irving, assistant engineer of the Iowa division of the Chicago & North Western, with headquarters at Boone, Iowa, has been promoted to division engineer of the Minnesota division, with headquarters at Winona, Minn., succeeding **W. J. Jackson,** deceased. Mr. Irving will be succeeded at Boone by **C. H. Wells.**

Purchasing and Stores

A. J. Mello has been appointed purchasing agent of the San Diego & Arizona, with headquarters at San Diego, Cal., succeeding **S. P. Howard** resigned.

Obituary

F. H. Drake, vice-president of the Louisiana & Arkansas, with headquarters at Minden, La., died at his home in that city on March 11.

Charles Whipple Case, formerly general manager of the Great Northern, with headquarters at St. Paul, Minn., died at his home in Minneapolis, Minn., on March 18. Mr. Case was born on October 22, 1834, at Buffalo, N. Y. He entered railroad service on August 31, 1851, as a brakeman on the Milwaukee & Mississippi. He was promoted to fireman in November of that year, and in November, two years later, he left to become locomotive engineer on the Milwaukee & Watertown. From September, 1855 to December, 1861, he was a locomotive engineer on the LaCrosse & Milwaukee, and from September, 1865 to May 31, 1867, he was an agent on the Winona & St. Peter (Chicago & North Western), successively at Rochester, Minn., Kasson, Owatonna, and Winona. From June, 1867, to November of that year, he was agent of the Chicago, Milwaukee & St. Paul at Cresco, Iowa, and from November 15, 1867, until November 1, 1876, he was freight and ticket agent of the same road at Minneapolis, Minn. From November, 1876, until January, 1882, he was successively assistant superintendent of the Iowa & Minnesota, River and Hastings & Dakota divisions. He was promoted to superintendent of the Hastings & Dakota division on January 1, 1882, which position he held until February 20, 1883, when he was transferred to the River and Dubuque divisions. On September 15, 1886, he was made assistant general superintendent. He left on October 1, 1888, to become general superintendent of the St. Paul, Minneapolis & Manitoba (Great Northern), with headquarters at Minneapolis. He was promoted to general manager on December 1, 1893, which position he held until August, 1894, when he retired from railroad service.